POPULAR Computing WEEKLY

FREE GAMES CASSETTES

35p 22-28 September 1983 Vol 2 No 38

This Week

STAR GAME
Connect 4 on Commodore 64. See page 10.

News Desk

An enterprising move from Elan

ELAN Computers last week announced details of its first two home computers

Called the Enterprise 64 and 128 — the two models differ only in Ram capacity — both will be in the shops in April 1984 Prices will be £199 95 and £299 95 for the two models

The Enterprise is Z80A-based with 32K Basic Rom and either 64K or 128K Ram Rom and Ram are both expandable to 3 9M Main features of the machine are a full-travel keyboard high-resolution display in up to 256 colours, 8-octave four-voice stereo sound, built-in word-processing software and a built in joystick for cursor control and games

The Elan Enterprise has a complex system of 16 display modes which can be mixed on-screen Explained Robert Madge, Elan's technical director I think everyone is going to be a bit bowled over by the speed of the machine s plotting Text modes range from 42 × 28 characters to 84

Continued on page 5

Oric will compete with IBM Peanut

ORIC Products International will produce a new computer to compete with IBM's proposed low-cost Peanut computer

"The IBM Peanut will be hugely successful and set a standard and we will be in there with it said Oric s managing director Barry Muncaster Oric will produce a product which the Peanut will be compatible with," he added

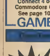
As usual with any new IBM product secrecy surrounds its precise nature A spokeswoman for IBM declined to comment on the new machine save to confirm its existence

"It will be an 8086-based machine — that is our best guess at this point, said Tom Crotty of the US market analysts Gartner Group

'With IBM there is nothing sure until it is launched There are a lot of rumours flying about that the Peanut will not be compatible with the 8088-based IBM PC

Continued on page 5

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Continued on page 40

DRAGON

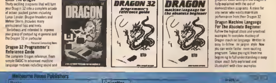
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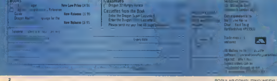


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Accuracy

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This Week

Editorial

Sinclair s flat-screen tv may, or may not, do for television what the transistor radio did for wireless It will certainly do a lot for Sir Clive s reputation as Britain's 'golden boy of electronics

The flat-screen tv is not a new idea — scientists have long been speculating about tv screens just a ½in thick which could be hung on walls Pocket-sized flat-screen tvs have also been mooted for some time But, until this year, no one had really been able to produce a commercially viable flat-screen tv for general consumption

Sony pipped Sinclair to the post with its Watchman flat-screen tv, due in part to industrial trouble at Timex's plant in Dundee But the Watchman, brainchild of Sony designer Yasuo Kuroki, is bulkier and more expensive than Sinclair s offering Even the improved Watchman II will cost about $200 in the US, compared to Sinclair's £79 95 in the UK

Sinclair's flat-screen tv may not be the first, but it is the cheapest it is also one of the most technically advanced, being able to receive signals in both the UK, US and Europe

Once the problems of producing a colour flat-screen tv are solved, Britain's micro users will be able to dream of a new generation of computers that will be truly portable

Next Thursday

Centipede next week s star game for the 48K Spectrum, is a version of the arcade game and the object is to shoot all the bugs which attack you. By Jim Provan.

A new generation of Computer Games...

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ZX Spectrum 16/48K, £8.95

.....placed at your fingertips by the ingenuity of Abrasco's wizardry. As the Fly Snatcher you have to catch flies [illegible]

Take it easy with this marvellous electronic brain and its extensive foolproof programs as it copes with the numerous problems of a Home Manager. Abrasco's miraculous Electronic Spreadsheet Abracalc provides instantaneous solutions to a multitude of complex problems, yet is simple to use and exceedingly good value. High seas adventure as Captain of a galleon scouring the seas for roaming pirates while avoiding falling off the edge of the world in this hi-res graphic game Pirate. Superb graphics compliment your skill and judgement as you prepare to pot the last ball to capture the championship in a blaze of glory, with Pool. Realistic simulation in Golf tests your golfing skills to the limits as you encounter bunkers, rough, trees and wind in an effort to win the round.

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Oric v Peanut

Continued from page 1

"I personally find it hard to believe that they would exclude themselves from all the PC's software

"But whatever. You can be sure that there will be artificial barriers in Peanut to make it non-upgradable to the PC," he added.



Barry Muncaster

The Peanut, Sinclair's new 'professional' computer and now Oric's planned computer are all aimed at an as yet untested market — straddling the gap between home and business systems. Some industry observers believe that this new market will prove to be by far the biggest of the lot.

● Oric's disc system for the Oric 1 computer has been delayed. The company plans to build 1,500 units in December. Said Barry Muncaster: "Realistically there won't be many in the UK before Christmas. We now have it all working — it just depends on the quantities of drives which Hitachi can supply.

"The numbers we have been promised from January look very promising, ramping up from 2,500 to 4,000 in three months."

Enterprising Elan

Continued from page 1

× 28. Up to four pairs (foreground and background) or colours chosen from the 256-colour pallet can be used in text modes.

Graphics modes go up to the highest resolution of 672 × 256 pixels with a limit of two colours on each horizontal line. The number of colours which can be used in one line from the 256 possible squares every time the number of pixels in a line is halved. For example up to 16-colours can be used in one line for a 168 × 256 display.

Commands exist in the Basic — Elan's own — for taking blocks of memory and loading them directly on to the screen.

The machine has a cartridge port capable of taking a 64K Rom pack, twin cassette ports, twin joystick ports, Centronic and RS423 interfaces, tv, monitor, cassette and headphone connections are also provided.

An expansion bus gives access to additional memory packs and twin 3½ inch microfloppy disc drives or other peripherals. The Enterprise is CP/M compatible. Memory organisation on the Elan is in 16K pages. Additional memory can be stacked up in 64K units.

The Basic is organised such that extensions to the software to control peripherals are automatically hooked into the standard Basic when the additional module is connected. A 'base unit' — providing additional power — is however necessary to connect the first unit. The first of these peripheral units is scheduled for June 1984, two months after launch. Software for the Elan machines is being written by Intelligent Software and a number of other software houses have expressed interest in producing material. Lisp and Forth will both be available as alternative languages.

Elan Computers is a new company (see *Popular Computing Weekly*, August 17), formed by software house Intelligent Software and Hong Kong electronics manufacturers Domicrest. The Elan computers will be 75 percent manufactured and assembled at two factories in the UK.

The idea for Elan apparently came from an unnamed international finance consortium which then approached Intelligent and Domicrest to carry out the project.

Flat-screen unmasked by Sir Clive

SIR Clive Sinclair unveiled his flat screen tv in London last week. Slightly larger than a cigarette packet, the black and white tv is the result of a six-year development programme which cost £4m.

The tv set runs off a lithium based flat battery developed by Polaroid, though it can also be run off the mains with the aid of an adaptor. Key to the new tv is a flat-screen cathode ray tube and a single integrated circuit, which allows the tv to work in the US and Europe as well as in the UK.

Priced at £79.95, including VAT, Sinclair's flat-screen tv is considerably cheaper than Sony's Watchman tv launched earlier this year.

Sinclair regards his flat-screen tv as "a major breakthrough" and said, "I believe it and its successors can achieve for television what the transistor radio did for wireless."

Sir Clive is currently working on a colour flat-screen tv but is unwilling to commit himself to any completion dates.

Microcomputer owners will be disappointed to learn that it is not really feasible to link a micro with the new tv. The 2in screen is simply too small for program lines to be legible.

Initially, Sinclair's flat-screen tv will be available by mail order only. Application forms are available on request from Sinclair Research Ltd, TV Division, Stanhope Road, Camberley, Surrey (Tel 0276 62111).

● Meanwhile, Japanese electronics giant Matsushita has announced the development of a portable colour television set.

The device, about the size of a handbag, uses back projection on to a pop-up translucent screen 16cm across.

ZX81 and Spectrum taken to task

MULTI-TASKING on the ZX81 and Spectrum is now possible, thanks to a Poole based outfit called David Husband.

The company is now offering a Forth multi-tasking Rom replacement for the ZX81 for £28.75. A Spectrum plug-in cartridge module is also on the way in a couple of weeks for £63.56.

"I'm hoping it will shake people up a bit," says company founder David Husband. "In the computer market the hardware has jumped forward while the software has stayed still.

"I see the Forth Rom as something fundamentally new — a very low cost multi-tasking system with a Z80 and 16K."

The 2K ZX81 Rom features a built-in editor with user defined split screens and the multi-tasking which can schedule up to 10 tasks at predetermined times. Machine code definitions are automatically threaded into the Forth.

The Spectrum cartridge version is more ambitious — a 12K fig-Forth with multi-tasking and built-in RS232 and Centronics interfaces.



The ZX81 Rom replacement can be undertaken by the user but it involves removing the existing Basic Rom which is soldered in. ZX81s complete with the Forth Rom in place and 16K Ram pack can be bought from Densham Computers, 329 Ashley Road, Parkstone, Poole.

Details of either the ZX81 or Spectrum multi-tasking systems from David Husband, 2 Gorleston Road, Branksome, Poole.

Barbican goes personal

THIS year's 6th *Personal Computer World Show* kicks off next week at the Barbican Centre, London.

The Show is open to the public from Thursday September 29 to Sunday, October 2. Times are 10 am to 7 pm every day except Sunday which is 10 am to 5 pm. Entry is £3.


At last...
A joystick that works!

Martian error

Before we lay the Martians to rest (my letter *PCW* 25-31 August) would you please point out to readers that the Martian word for 'yes' is *qwl* not *gwl*. Otherwise my remarks do not make sense.

A W Rowe
69 Longley Lane
Huddersfield HO4 6PR

Apologies. I am afraid that our knowledge of Martian is such that the spelling error slipped through unnoticed.

Speedy reviews

Having just been introduced to your excellent weekly computer newspaper I would like to comment on the impressive speed of your reviews. How do you do it? The reviews are always interesing quoting your Microdrive review as an example.

I always turn firstly to your reviews and then your informative letters page. I have just read Philip Crawley of Buckwell, Salop's letter and I would like to inform him of my high score for *Orbiter*, 651,910. The completion of this took just over two hours — beat that.

Paul Holden
110 Crescent Road
Great Lever
Bolton BL3 2JR

Play fair, Dragon

The long wait for the arrival of Dragon Data's discs is over. However the speed in which the Premier Delta system came onto the market must have taken a large share of the dedicated Dragon user's who now might want to run Dragon based disc software on their already bought ⅗in high Cannon drive.

It seems that, at first glance Dragon Data has built a type of non compatibility into its system — the one half height drive (with a location for the second) is a standard drive and can be run with the Delta controller, but only allows you 110 bytes, not the 185 allowed by the Dragon controller. What Dragon Data has in fact done is to put a small saw cut into the disc side of the controller's connection board which allows a small piece of plastic located in the connector of the controller/drive lead to mate up with, allowing only a Dragon lead to be used with a Dragon controller. This in fact can be removed and will fit onto the Delta controller.

Dragon has also moulded its controller cover so that you cannot get the Delta lead on the Dragon controller without having an extension board or cable made up. Another point is that Dragon Data appears to have no intention of selling the controller separately.

Come on, Dragon, play fair — sell the controller separately and save the dedicated user from unnecessary expense.

Hywel Francis and
Dave Barrell
TWM Software
8 Azalea Close
Cyncoèd
Cardiff

Random statement

If any Dragon owners are upset with the apparent lack of a *Randomize* statement or its equivalent, so that random numbers are always generated from the same starting point, resulting in the same game of *Mastermind* or whatever on power-up, try the following:

```
10 Input "Random number seed" A
20 A - RND (- A)
```

Any numbers subsequently generated may be considered random and the same sequence can be generated by using the same "seed" value for A.

For an unrepeatable sequence try:

```
10 A = RND (- Timer)
```

I hope this will be of benefit to any frustrated Dragon owners.

David Harcourt
34 Old Ballymony Road
Ballymena
Co Antrim
N Ireland

Debugging exercise

The program from T Choy *The Root of the Problem* (*PCW* 8-14 September) was excellent stuff — can I put in a plea for even more actually intelligent material such as this and the recent astronomical programs, in future issues — preferably at the expense of the ceaseless round of Zap-the-Alien drivel (may I also, en passant, add my vote to the requests for a Spectrum machine code series).

However, Mr Choy's program, as printed, contains a few bugs which prevent it, for example, from solving

$x^4 - 16 = 0!$

Also, while it will tackle

$$x^4 - 3x^3 + 3x^2 - 3x + 2 = 0 \quad (1)$$

successfully, the related equation

$$x^4 + 3x^3 + 3x^2 + 3x + 2 = 0 \quad (2)$$

whose roots are simply minus the roots of (1), has it completely flummoxed. Debugs follow.

(a) Omit line 538 entirely. Its only purpose is to prevent you demeaning the dignity of your machine by giving it trivial cubics to solve. The snag is that the cubic routine, as well as solving cubics in its own right, also gets called by the quartic routine, and a perfectly genuine request to solve a non-trivial quartic, can snarl up on the program's sense of dignity as to what cubics are worthy of it.

(b) Line 620, as printed, will fail if *R* is negative, since the Spectrum uses logs to do this calculation. Change it to read:

```
620 LET X2 = (E = SGN R = (ABS
    R) ↑ T)/A LET X3 =
    -X2 GO TO 730
```

(c) Line 1018 is a classic *If ... Then* snarl up. Amend to read:

```
1018 IF M < 1 THEN LET M = 1
1019 IF M > 2 THEN LET M = 2
     REM Whoopee!
```

(d) (The big one) Line 850 includes *Let V = Sqr P2*. The snag is that the machine will always take the positive square root, while sometimes the negative root is required (this is why equation (2) fouls up). To debug, change line 857 to:

```
857 DIM A(2 2) IF 2 * U * V < > RO
    - RM * Y1 THEN LET V =
    -V
```

All in all, an excellent debugging exercise. I thoroughly enjoyed myself. However, something in my water tells me that was not what you had in mind when you published it.

Jim Hind
5 Park Street
Southend
Essex

Plot to print solutions

With regard to the query in *PCW* 25-31 August, in your Peek and Poke feature relating to conversion of *Plot* to *Print* I offer the following solutions. I'm not certain what your correspondent had in mind, but I hope these are of some help.

In the case of *Plot* to *Print* care should be taken that there is room on the screen for what it is desired to do. In the case of *Print* to *Plot* the *Print* statement should be followed by ;.

With regard to the *Screen$* query, this in fact returns a character, and not a numeric value as stated.

Michael Kirkland
20 Batey Avenue
Rainhill
Prescot
Merseyside L35 8LT

```
Print to Plot
  10 REM GO SUB after any PRINT
statement.          On exit, PLOT
position is at the bottom right
of last PRINT pixel, and is in
variables x and y.
1000 POKE 23677,7-PEEK 23688*8
1010 POKE 23678,(PEEK 23689-3)*8
1020 LET x=PEEK 23677
1030 LET y=PEEK 23678
1040 PLOT x,y
1050 RETURN
```

```
Plot to Print
  10 REM  GO SUB after PLOT  or
DRAW statement.  On exit, PRINT
AT x,y
1300 POKE 23688,PEEK 23677/8
1010 POKE 23689,21-PEEK 23678/8
1020 LET x=PEEK 23689
1030 LET y=PEEK 23688
1040 RETURN
```


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Connect Four

A new game for the Commodore 64 by Les Allen

Connect Four for the Commodore 64 utilises hi-resolution graphics to produce an on screen version of the popular board game of the same name In order to make use of the full screen each disc is made up of 4×3 characters end the graphics for the row numbers are arranged to be in the centre of each disc Simon s Basic commands have been used throughout but the program can be easily rearranged to run on the basic machine

During play the selected row for each disc is made by pressing keys *1* to *7* Pressing *F1* resets a game whereas *F7* recalls the instruction page prior to the start of each new game

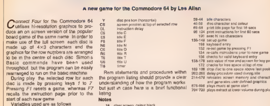
Variables used are as follows

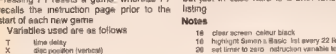
T	time delay
X	disc position (vertical)
Y	disc position (horizontal)
C$	screen position at top of selected row
DL	instruction delay
C$	title C
E$	title E
F$	title F
N$	title N
O$	title O
R$	title R
T$	title T
U$	title U
TI$	timer

Rem statements and procedures within the program listing should provide a clear understanding of how the program works but just in case here is a brief functional listing

Notes

16	clear screen colour black
18	highlight Simon s Basic list every 22 lines
26	set timer to zero instruction variable to 18
38-44	title characters
46-58	disc character and colour
60-88	print title page for first 18 secs
96 124	print instructions for first 60 secs
126	exec hi res characters
138-148	set up game
150	keyboard entry
152	re-set game by pressing F1
154	re-calls instructions prior to new game
156	checks for valid keyboard entry
158-178	sets value of row and screen for key pressed
172	checks for free space at top of row
182 196	drop disc to one space above last position
202 208	delay procedure used during title
214-670	relocates screen memory and character set and generates user defined graphics
676-698	plays music at game start
704 720	plays extract at lower volume during play





Connect Four ....

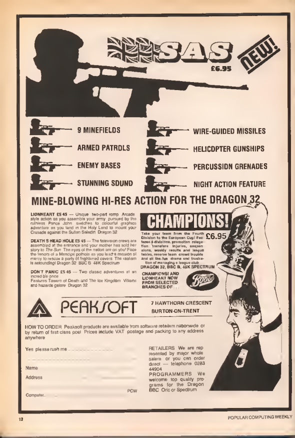
Discs may be connected together either horizontally, vertically or obliquely to place 4 in a row.

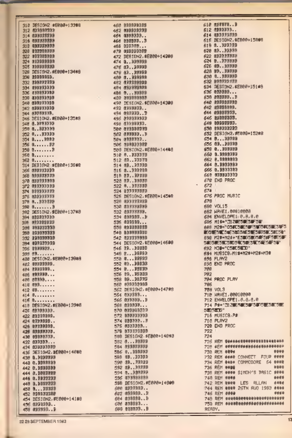
Use keys 1-7 to select your row

[F1] ....resets a game
[F7]....recalls instructions

```
10
12 REM #### CLEAR SCREEN/COLOUR
BLACK ####
14
16 PRINTCHR$(147) COLOUR0,0
18 OPTION10 PAGE22
20 DL=10 TI$="000000"
22 EXEC MUSIC
24
26 REM #### TITLE CHARACTERS
####
28
30 C$="[illegible]"
32 D$="[illegible]"
34 N$="[illegible]"
36 E$="[illegible]"
38 T$="[illegible]"
40 F$="[illegible]"
42 U$="[illegible]"
44 R$="[illegible]"
46 X$="[illegible]ABCDEEF[illegible]GHIJ[illegible]"
48 Y$="[illegible]"
50 Z$=CHR$(150)
52
54
56 PROC PRINT TITLE
58
60 PRINTAT(2,3)CHR$(5)C$ EXEC
DELAY
62 PRINTAT(6,3)CHR$(28)O$ EXEC
DELAY
64 PRINTAT(12,3)CHR$(159)N$ EXEC
DELAY
66 PRINTAT(18,3)CHR$(156)N$ EXEC
DELAY
68 PRINTAT(24,3)CHR$(30)E$ EXEC
DELAY
70 PRINTAT(30,3)CHR$(31)C$ EXEC
DELAY
72 PRINTAT(35,3)CHR$(158)T$ EXEC
DELAY
74 PRINTAT(3,14)CHR$(129)F$ EXEC
DELAY
76 PRINTAT(15,14)CHR$(150)O$ EX
EC DELAY
78 PRINTAT(21,14)CHR$(153)U$ EX
EC DELAY
80 PRINTAT(27,14)CHR$(154)R$ EX
EC DELAY
82 PRINTAT(34,20)"BY[illegible]LES[illegible]
[illegible]ALLAN", EXEC DELAY
84 FORY=1TO10 EXEC DELAY
86 NEXT
88 IFTI$<"000018"THENPRINTCHR$
(147) CALL PRINT TITLE
90 IFTI$>"000050"THENCALL GAME
START
92
94
96 PROC INSTRUCTIONS
98
100 PRINTCHR$(147)
102 HIRES6,7 COLOUR7,7
104 TEXT20,20,"CONNECT FOUR",1,"
6,16
106 TEXT250,50,"####",1,2,13
108 TEXT20,100,"DISCS MAY BE CO
NNECTED TOGETHER",1,1,9
110 TEXT20,110,"EITHER HORIZONT
ALLY, VERTICALLY",1,1,9
112 TEXT20,120,"OR OBLIQUELY
TO  PLACE 4 IN A ROW.',1,1,8
114 TEXT20,140,"USE KEYS 1-7 TO
SELECT YOUR ROW",1,1,9
116 TEXT50,160,"[F1] ..........
RESETS A GAME",1,1,8
118 TEXT50,170,"[F7]....RECALLS
INSTRUCTIONS",1,1,8
120 REC5,5,310,190,1 REC10,10,3
00,180,1
122 BLOCK15,15,305,70,2
124 PAUSEDL NRM
126 EXEC HI-RES DATA
128
130
132 PROC GAME START
134
136 PRINTCHR$(147) COLOUR0,0
138 X=0 CS=0 DL=2
140 PRINTAT(1,24)"[illegible]"CHR$
(150)"MN[illegible]OP[illegible]QR[illegible]ST[illegible]
[illegible]'CHR$(154)"UV[illegible]WX",
142
144
146 PROC KEYBOARD
148
150 GETK$
152 IFK$=CHR$(133)ANDCS<>0THENP
RINTCHR$(147):CALL PRINT TITLE
154 IFK$=CHR$(136)THENCALL INST
RUCTIONS
156 IFK$=""ORK$<"1"ORK$>"7"THEN
CALL KEYBOARD
158 IFK$="1"THENCS=52306:Y=0
160 IFK$="2"THENCS=52312:Y=6
162 IFK$="3"THENCS=52318:Y=12
164 IFK$="4"THENCS=52324:Y=18
166 IFK$="5"THENCS=52330:Y=24
168 IFK$="6"THENCS=52336:Y=30
170 IFK$="7"THENCS=52342:Y=36
172 IFPEEK(CS)<>32THENCALL KEYB
OARD
174 EXEC PLAY
176
178 REM #### DROP DISC ####
180
182 REPEAT
184 IFX>0THENPRINTAT(Y,X-1)Y$,
186 PRINTAT(Y,X)Z$X$,
188 X=X+1 CS=CS+40
190 FORT=1TO25 NEXT
192 UNTIL PEEK(CS+40)<>32
194 IFZ$=CHR$(150)THENZ$=CHR$(3
0) ELSE Z$=CHR$(150)
196 POKE198,0:X=0:CALL KEYBOARD
198
200
202 PROC DELAY
204
206 FORT=1TO75 NEXT
208 END PROC
210
212
214 PROC HI-RES DATA
216
218 MEM
220 DESIGN2,$E000+128*8
222 @........
224 @........
226 @.......B
228 @......BB
230 @....BBBB
232 @...BBBBB
234 @..BBBBBB
236 @.BBBBBBB
238 DESIGN2,$E000+129*8
240 @.......B
242 @..BBBBBB
244 @BBBBBBBB
246 @BBBBBBBB
248 @BBBBBBBB
250 @BBBBBBBB
252 @BBBBBBBB
254 @BBBBBBBB
256 DESIGN2,$E000+130*8
258 @B.......
260 @BBBBBB..
262 @BBBBBBBB
264 @BBBBBBBB
266 @BBBBBBBB
268 @BBBBBBBB
270 @BBBBBBBB
272 @BBBBBBBB
274 DESIGN2,$E000+131*8
276 @........
278 @........
280 @B.......
282 @BB......
284 @BBBB....
286 @BBBBB...
288 @BBBBBB..
290 @BBBBBBB.
292 DESIGN2,$E000+132*8
294 @.BBBBBBB
296 @BBBBBBBB
298 @BBBBBBBB
300 @BBBBBBBB
302 @BBBBBBBB
304 @BBBBBBBB
306 @BBBBBBBB
308 @.BBBBBBB
```

Continued on page 13


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```
310 DESIGN2,$E000+133*8
312 @BBBBBBBB
314 @BBBBBBBB
316 @BBBBBBBB
318 @BBBBBBBB
320 @BBBBBBBB
322 @BBBBBBBB
324 @BBBBBBBB
326 @BBBBBBBB
328 DESIGN2,$E000+134*8
330 @BBBBBBB.
332 @BBBBBBBB
334 @BBBBBBBB
336 @BBBBBBBB
338 @BBBBBBBB
340 @BBBBBBBB
342 @BBBBBBBB
344 @BBBBBBB.
346 DESIGN2,$E000+135*8
348 @.BBBBBBB
350 @..BBBBBB
352 @...BBBBB
354 @....BBBB
356 @......BB
358 @.......B
360 @........
362 @........
364 DESIGN2,$E000+136*8
366 @BBBBBBBB
368 @BBBBBBBB
370 @BBBBBBBB
372 @BBBBBBBB
374 @BBBBBBBB
376 @BBBBBBBB
378 @..BBBBBB
380 @.......B
382 DESIGN2,$E000+137*8
384 @BBBBBBBB
386 @BBBBBBBB
388 @BBBBBBBB
390 @BBBBBBBB
392 @BBBBBBBB
394 @BBBBBBBB
396 @BBBBBB..
398 @B.......
400 DESIGN2,$E000+138*8
402 @BBBBBBB.
404 @BBBBBB..
406 @BBBBB...
408 @BBBB....
410 @BB......
412 @B.......
414 @........
416 @........
418 DESIGN2,$E000+139*8
420 @BBBBBBB.
422 @BBBBBBB.
424 @BBBBBB..
426 @BBBBBBB.
428 @BBBBBBB.
430 @BBBBBBB.
432 @BBBBB...
434 @BBBBBBBB
436 DESIGN2,$E000+140*8
438 @.BBBBBBB
440 @.BBBBBBB
442 @.BBBBBBB
444 @.BBBBBBB
446 @.BBBBBBB
448 @.BBBBBBB
450 @...BBBBB
452 @BBBBBBBB
454 DESIGN2,$E000+141*8
456 @BBBBBB..
458 @BBBBB..B
460 @BBBBBBBB
462 @BBBBBBBB
464 @BBBBBB..
466 @BBBBB..B
468 @BBBBB...
470 @BBBBBBBB
472 DESIGN2,$E000+142*8
474 @..BBBBBB
476 @B..BBBBB
478 @B..BBBBB
480 @..BBBBBB
482 @BBBBBBBB
484 @BBBBBBBB
486 @...BBBBB
488 @BBBBBBBB
490 DESIGN2,$E000+143*8
492 @BBBBBB..
494 @BBBBB..B
496 @BBBBBBBB
498 @BBBBBBB.
500 @BBBBBBBB
502 @BBBBB..B
504 @BBBBBB..
506 @BBBBBBBB
508 DESIGN2,$E000+144*8
510 @..BBBBBB
512 @B..BBBBB
514 @B..BBBBB
516 @..BBBBBB
518 @B..BBBBB
520 @B..BBBBB
522 @..BBBBBB
524 @BBBBBBBB
526 DESIGN2,$E000+145*8
528 @BBBBBBBB
530 @BBBBBBBB
532 @BBBBBBB.
534 @BBBBB..B
536 @BBBBB...
538 @BBBBBBBB
540 @BBBBBBBB
542 @BBBBBBBB
544 DESIGN2,$E000+146*8
546 @B..BBBBB
548 @...BBBBB
550 @...BBBBB
552 @B..BBBBB
554 @...BBBBB
556 @B..BBBBB
558 @B..BBBBB
560 @BBBBBBBB
562 DESIGN2,$E000+147*8
564 @BBBBB...
566 @BBBBB..B
568 @BBBBB...
570 @BBBBBBBB
572 @BBBBBBBB
574 @BBBBB..B
576 @BBBBBB..
578 @BBBBBBBB
580 DESIGN2,$E000+148*8
582 @...BBBBB
584 @BBBBBBBB
586 @..BBBBBB
588 @B..BBBBB
590 @B..BBBBB
592 @B..BBBBB
594 @..BBBBBB
596 @BBBBBBBB
598 DESIGN2,$E000+149*8
600 @BBBBBB..
602 @BBBBB..B
604 @BBBBB..B
606 @BBBBB...
608 @BBBBB..B
610 @BBBBB..B
612 @BBBBBB..
614 @BBBBBBBB
616 DESIGN2,$E000+150*8
618 @..BBBBBB
620 @B..BBBBB
622 @BBBBBBBB
624 @..BBBBBB
626 @B..BBBBB
628 @B..BBBBB
630 @..BBBBBB
632 @BBBBBBBB
634 DESIGN2,$E000+151*8
636 @BBBBB...
638 @BBBBB..B
640 @BBBBBBBB
642 @BBBBBBB.
644 @BBBBBBB.
646 @BBBBBBB.
648 @BBBBBBB.
650 @BBBBBBBB
652 DESIGN2,$E000+152*8
654 @...BBBBB
656 @B..BBBBB
658 @..BBBBBB
660 @.BBBBBBB
662 @.BBBBBBB
664 @.BBBBBBB
666 @.BBBBBBB
668 @BBBBBBBB
670 END PROC
672
674
676 PROC MUSIC
678
680 VOL15
682 WAVE1,00010000
684 ENVELOPE1,0,8,0,0
686 M1$="J12■E5■E5■F5■"
688 M2$="G5■C5■E5■F5■F5■C5■E5■F5
■G5■E5■C5■E5■D5■E5■E5■D5■C5■C5■"
690 M2$=M2$+"E5■D5■D5■F5■F5■E5■F
5■G5■E5■C5■D5■C5■E5■C5■E5■F5■"
692 M3$="C5■C5■G"
694 MUSIC8,M1$+M2$+M2$+M3$
696 PLAY2
698 END PROC
700
702
704 PROC PLAY
706
708 VOL3
710 WAVE1,00010000
712 ENVELOPE1,0,8,0,0
714 P$="J12■E5■E5■F5■F5■E5■C5■E
5■D5■G"
716 MUSIC8,P$
718 PLAY2
720 END PROC
722
724
726 REM ########################
728 REM ########################
730 REM ####                ####
732 REM #### CONNECT  FOUR  ####
734 REM #### COMMODORE  64  ####
736 REM ####                ####
738 REM #### SIMON'S BASIC  ####
740 REM ####                ####
742 REM ####  LES  ALLAN    ####
744 REM #### 25TH AUG 1983  ####
746 REM ####                ####
748 REM ########################
750 REM ########################
READY.
```



MY NAME IS DIAMOND, DAN DIAMOND I'M A PRIVATE COP. I WORK THE BIG APPLE A SEETHING METROPOLIS FILLED WITH HUMAN MISERY AND CHINESE TAKEAWAYS.
NORMALLY I ONLY DO ROUTINE DIVORCE CASES BUT WHEN SHE WALKED INTO MY OFFICE I FOUND MYSELF INOLVED IN A CASE SO STRANGE THAT IT MADE THE BIG SLEEP LOOK LIKE A CAT NAP...
NEWS
HUNT WINS GRAND PRIX
At yesterday's Monaco Grand Prix a hunting party strayed onto the track at the climax of the race. Cars were halted as the hounds rampaged around the circuit. 'The whole place has gone to the dogs,' one driver was reported as saying. The race was restarted, riders and drivers battled bitterly around the course before the Hunt thundered past the finishing line to take the chequered flag (it hasn't been seen since).
PLAYER WINS OPEN
Eagle eyed spectators were privileged to see
Salamander SOFTWARE
PRIVATE DETECTIVE DISAPPEARS
Police are baffled by the disappearance of Dan Diamond. He was last seen approaching the eerie edifice known as Franklin's Tomb, but the authorities are completely unable to find any trace of him. Citizens are asked to report any information relating to his disappearance immediately. For further details buy FRANKLINS TOMB a new adventure game for the DRAGON 32 and 48k ORIC 1. This adventure comes complete with a 24-page illustrated Case File. £9.95 from BOOTS SPECTRUM COMPUTERS FOR ALL WEB
BANANA DICTATOR
2 DEAD IN EVEREST TRAGEDY
The Everest Exped ended in tragedy terday as Carl and plunged down a to a grisly death the expedition was quoted as Yuk Continued
COLD WAR XARG ESCA
Thousands de in Ice Storm

Logan's run . . .

***David Kelly** talks to Ian Logan, author and machine code expert*

Despite an enviable reputation as an authority on Z80 machine-code Ian Logan still regards himself as an amateur enthusiast

A graduate in medicine from Sheffield he qualified as a GP But his first attempt to get involved with computers was a failure — he was turned down for a job as a doctor for ICL. 'They gave me a nice lunch but I didn't get the job

After that he spent nine years working as a GP — still with a faint hope of somehow, someday becoming involved in computers

In 1980 he joined the Lincolnshire Microprocessor Society Through the group he met people who had Pets and Tandys "I borrowed a Pet for a fortnight — and it sat on the table downstairs I didn't really know what to do with it

Then he bought a ZX80 Bob Maunder of Linsac put an advertisement in one of the magazines saying he wanted ZX80 programs says Ian 'I phoned him up and discovered I knew more about the machine than he did

The two decided to produce a book for the machine — which became Ian's first book. A small spiral-bound handbook called *The ZX80 Companion* Ian wrote about one third of it — the rest was written by Bob and another writer, Terry Trotter It came out in September 1980

All of Ian's knowledge of the ZX80 is self taught Back in 1980 there were no introductory tutorial books on machine code programming such as there are now

At that time I always used to think that somebody somewhere knew all there was to know about machine code programming Now I have found out there never were any — there still are no experts

Bob Maunder was unable to publish Ian's next book on ZX80 machine code, and suggested he try to find another publisher There I was, a week after the ZX81 was launched, going round this micro show trying to get someone to publish a manuscript written for the ZX80

After a couple of people turned me down I answered an advertisement from Melbourne House

I got a phone call from Australia when I was over at the village hall mowing the lawn and my wife came running across to tell me The call was from Fred Milgrom and that is how I started writing for Melbourne House

Fred Milgrom asked Ian to convert his book for the ZX81 ' Melbourne House apparently made a lot of money out of some sensational book published in Australia about female sex hormones But Fred has a great interest in computers — and in particular he loves adventure games

And he has some very good programmers out there with him now — like Philip Mitchell who wrote *The Hobbit*

Ian's first book for Melbourne House was published in September 1981 — almost exactly a year after his first.

Next came a chance meeting with Frank O'Hara — a government statistician "Frank thinks and lives numbers,' says Ian 'And he understands all the mathematics which I don't " Together they wrote *Understanding Your ZX81 Rom* 'I started ZX81 disassembly from the front and he started from the back We met in the middle"

Then the Spectrum came out — Ian and Frank have recently written *The Complete Spectrum Rom Disassembly* for it The book is doing very well — because nobody else has attempted anything like it

For the last couple of months Ian has been preparing yet another book *The Spectrum Microdrive Book*. This book is a departure for Ian — for the first time he is writing about his own work

From Christmas until Easter Ian worked two days a week for Sinclair writing software for the Interface 1, which is necessary to connect the Microdrive to the Spectrum

Ian's book on the Microdrive and Interface 1 will be published in either late September or early October

Since working on and writing a book about, the Microdrive Ian has become something of an authority on the device

People don't seem to be as excited about the networking possibilities as I thought they would be — there is no reason why you cannot join up Spectrum Net to other computers Networking is great fun

"The other thing people don't seem to have realised is that you can pass anything on the RS232 and store it on Microdrive — if you are prepared to use the Spectrum as a controller You could easily save software from a BBC onto Microdrive

"It remains to be seen if anyone will build Microdrive controllers for other machines to use them direct Although not difficult technically, it might be difficult to manufacture it at a low enough price — the Microdrive has a big ULA in it doing a lot of work

One of the most interesting things Ian has discovered is the existence of a set of software 'hooks' to enable users to access routines in the Interface Rom This means that anyone can now add new commands to the Spectrum ' You can add what you like — add new languages if you want These can only be written in Ram but if stored on Microdrive they could be loaded in each time before using the machine

When Ian was working at Sinclair he met Scott McCourt Scott was in charge of writing the system software for the Timex 2000 machine the US Spectrum equivalent He asked Ian to help — to go over to the US and write software for them

"They wanted to add new commands to the Spectrum says Ian The machine was a 1981 design and requirements for a 1983 computer have evolved since then They were going to have to redo the Spectrum printed-circuit board for the TS2000 to satisfy the US FCC regulations, and to make it compatible with the NTSC tv standard So while they were about it, they decided to produce an enhanced version with extra commands

"I'm not sure if Timex made the right decision — maybe they should have just put out the Spectrum more or less as it is and got it out over there earlier

During his two weeks stay with Timex Ian showed them how to add new commands and routines He extended the syntax checking and corrected some of the small bugs in the Spectrum's own Rom "I wouldn't want to make too much of the Spectrum's faults It is a very successful machine " he says "After all it is not often you need to use the number — *Int*65536 "

After the Microdrive book comes probably a TS2000 version of Ian's best-selling *Complete Spectrum Rom Disassembly* again with Frank O'Hara I don't know what I will do next — at the moment I'm sort of drifting from one thing to another I had a Vic20 all last winter — the plan was to write a book for it — but I got so frustrated at the way the machine software was organised

"Perhaps I ought to sit down and write some programs — but I don't like writing games very much I am going to have to learn a bit about 16-bit machine language That's going to be all the rage next year

' What I have found is that I like problem solving I enjoyed my work with Sinclair and Timex — and I'd like to do more I'd like to continue to be involved with the computer industry and I don't feel as though I am at present People like me don't get employed by a company if they can do it themselves ■

Hitchcockian nightmare

***John Scrivan** picks his way through another selection of Spectrum software*

In the months since the Spectrum first nosed its way on to the market, there has been a drastic improvement in the available software.

The first games were mostly coloured copies of ZX81 favourites, with a lot of slow Basic programs thrown in for good measure. When programmers had got the hang of smooth movement in machine code, the standard began to improve. Even without the definition of the BBC and the sprite facilities of the Commodore 64, there is probably now a larger selection of good Spectrum software on the market than for any other machine.

Having spent several months with other machines, it was a pleasant surprise to be presented with a pile of games software for the Spectrum that was generally of a good standard. Although the old favourites were there and some novel but ultimately boring games, there was some of the best TV entertainment since Anne Diamond first graced my early morning screen.

Invaders from Artic includes the copyright notice and instructions on the loading screen, a good idea that many companies seem to employ nowadays. There are options at the start to choose game difficulty (1-9), the number of players (1-2) and game variation (1-4). This latter choice can provide you with mutant invaders and bombs from different angles. Should you be one of the seven people left in this country without your own copy of this game, then you will find this version reasonable enough, and with plenty of varieties to keep you amused for some time.

Gobble-a-Ghost from CDS Micro Systems and *Muncher* from Silversoft are both *Pacmen* in slightly different guises. *Gobble-a-Ghost*, with four ghosts and four power pills, provides instructions in the packaging but nothing on screen to help you. The controls used are *1* and *Q* for up and down, and *9* and *O* for left and right, a comfortable combination and slightly preferable to Muncher's use of *N* for down and *K* for up. At least manufacturers seem in the main to have stopped using the cursor control keys, apparently logical but in fact the worst choice.

Gobble-a-Ghost is reasonably difficult in the first frame, but there are no little extras that we have come to know and love, such as cherries, strawberries and names for the ghosts. *Muncher* has all these and a beautiful demonstration game at the start. Unfortunately, although the program loaded with no difficulty, the game itself refused to start, so I can't say how good it was in action.

Jawz from Elfin Software started off with some promise. The title page is good, and you can select the number of players and the difficulty level. The game is set off the coast, with a view from the seabed to the surface. You are provided with a base that can be moved left and right across the sand, firing at sharks that swim between you and the surface. Hanging just below the water-line are jelly-fish that drop poison pellets on to you.

The idea itself is novel and could have resulted in an interesting game. However, the sharks only swim left and right and you can even control how close to the surface they swim. Once you've destroyed one layer, another appears. Perhaps I missed some hidden subtlety, but the game rapidly became boring and yawningly predictable. If you suffer from insomnia this could be the ideal program for you.

Firebirds from Softek produces waves of flapping cosmic vultures that either crash into your base or drop unpleasant things (!?) on your head. If you kill enough of them, white motor cycle helmets progress down the screen and generally get in the way. Apparently, a mother-ship makes an appearance at some stage if you can put up with this Hitchcockian nightmare.

The screen has a wrap-around feature which is irritating, although the vultures zoom off to the left and reappear on the right, you cannot do the same. There are pretty little multi coloured displays in between individual games and this package is probably worth considering if you like alternative versions of space-zapping. If you prefer the real thing, try riding round Trafalgar Square on the back of a moped for half an hour.

Embassy Assault from Sinclair/ICL is another game that starts off with much promise. 'You are one of the country's best agents and have been given the task of acquiring some top secret codes from the strong-room of a foreign embassy.'

3D views inside the building are displayed, although not in great detail, and the game is rather slow, particularly in generating the maze of rooms (20 seconds for level one and three minutes for level nine). There are maps positioned on some of the walls, and stairs lead you to three other storeys.

When you reach the code room, there is an envelope on the wall. You don't have to pick it up, open it, decode it, or in fact do anything — you simply retrace your footsteps and leave the building. There are no guards to stop you and the only thing you play against is the clock, so there is little challenge in this game.

Yet another program that appears to offer a great deal at the start is *Schizoids* from Imagine. The cassette blurb invites you to be a space dustman and to help shove all the galaxy's garbage into the nearest black hole with your Space-dozer. The main disappointment is in the display, which is in black and white. Not an easy game to master, it is reminiscent of *Asteroids* in the type of controls you have for your craft, eg, rotate left and right, thrust, etc.

Usually you end up being splatted by some strange-shaped piece of rubbish, or else fall into the black hole yourself. One wonders which unfortunate part of the galaxy is at the receiving end for all this junk (come to think of it, I seem to have seen something like it in *PCW*'s offices — perhaps that's why they've changed their address recently).

Sentinal from Abacus is original and entertaining if you like space arcade games. A cross-shaped mother ship appears in the centre of the screen containing four rockets that you can launch and use to protect the main base. You can fire missiles and photon cannons as you steer the mini-rockets round the screen. There is even a force field that will temporarily repel invading aliens. Fast moving and using clear, high resolution graphics for the space-craft, this game proved to be above the usual standard of space games.

Another game that shows evidence of careful thought is *Spectra Smash* from Romik Software. Although it is only a version of *City Bomber*, it can be played with a variety of joysticks. There are nine different levels, not to mention anti aircraft fire.

The buildings that have to be bombed away before you can land are much too pretty — they look like a typical street in Amsterdam, complete with gable ends. If

you succeed in clearing the screen, you can make your touchdown in what must be the Dam square A fuel truck comes to your assistance and lets you take off to attack yet another area of Amsterdam (I know the Dutch are generous but this is ridiculous)

Although illogical in concept and dubious in morality, it's fun to play Also included is a copy of *Breakout* which is just as boring as it was when it first appeared in pubs six or seven years ago — but one shouldn't complain about a freebie game even if you'll rarely want to play it, unless you're feeling nostalgic

Having looked at a rather weak game from Imagine, it was a pleasure to find one of theirs that has appeared on the market more recently called *Jumping Jack* This is great fun original in concept and very addictive

On the surface a simple game, at higher levels it requires great concentration and the ability to keep a straight face while being pursued across the screen by a dinosaur, a jumbo-jet and a person with a shot-gun There are eight moving lines on the screen each one containing gaps that move in both directions You start at the bottom of the screen with eight lives and have to jump through the gaps to the next level

Although the holes are essential for moving up the screen, they also drop you back should you be running in the wrong direction If you fall to the bottom you lose a life Each time you reach the top a fresh screen appears identical except for the addition of a hazard (jumbo jets etc) Each screen cleared results in an extra hazard to avoid, so the 20th screen has 19 of these things rushing about To make it more interesting in between screens two lines of a verse appear

I greatly enjoyed this game and would recommend it whole-heartedly to anyone who can face frustration and horror as poor *Jumping Jack* misses the gap and crashes his head against the ceiling I suppose this is only to be expected — after all *Jumping Jack* and *Yossa Hughes* both originate from Liverpool

I have left until last what must be the most intricately conceived piece of software for the Spectrum since the first *Horace* game appeared on the market *Manic Miner* from Bug-Byte has an amusing setting — Miner Willy has found a hidden mine in south London and has to bring out all the treasure that he discovers there Willy can walk to the left and right and also jump This last movement is most essential, for the system is full of unpleasant creatures just out to get him

The first cave is the central cavern and jumping from level to level up the display (while negotiating one-way conveyor belts and disintegrating floors) enables him to collect several keys positioned in awkward places Should you manage to guide him to success before his air supply runs out he has to make his way to the bottom of the screen again and exit through a flashing door

If the game had been limited to this it would have provided a few hours fun and would have been as good value as several other cassettes reviewed here However, on passing through the door poor Willy enters another cave — the Cold Room with different levels and angry penguins guarding it Leaping over them is the only way to achieve success This cave is by no means the last however — and there is a total of 20 different screens, each one with different creatures and different techniques to solve before they can be mastered

The names chosen for the caves are very tongue-in-cheek and will be instantly recognised by arcade freaks — *Attack of the Mutant Telephones* and *Wacky Amoebatrons* being two examples My favourite cave is called *Eugene's Lair*, clearly aimed at a certain well-known programmer This cave is full of malevolent WC s, complete with flapping seats

In addition to the excellent game format there is on-screen scoring a musical opening title with moving piano keys and a demonstration of all the caves in the system Accompanying music can be turned off at any time

This game is so original amusing and habit-forming it will probably be voted No 1 Spectrum game this year If I ever meet Matthew Smith the author of this game I shall complain most bitterly about the program being released during the summer Were it not for this game I would certainly be more sun-tanned than I am at present! ■

Supplier	Program	Price	Value (1-10)
Artic Computing Main Street Brandesburton Driffield YO25 8RG	*Invaders*	£4 95	4
Bug Byte Mulberry House Canning Place Liverpool L1 8JB	*Manic Miner*	£5 95	10
CDS Micro Systems 10 Westfield Close Tickhill Doncaster S Yorkshire DN11 9LA	*Gobble-a-Ghost*	£5 95	7
Abacus Programs 718 Llangyfelach Road Swansea SA5 9EL	*Sentinel*	£5 00	8
Elfin Software Hudsons House Battery Road Great Yarmouth Norfolk NR30 3NN	*Jawz*	£4 95	5
ICL Sinclair Stanhope Road Camberley Surrey GU15 3PS	*Embassy Assault*	£4 95	5
Imagine Software Masons Buildings Exchange Street East Liverpool Merseyside L2 3PN	*Schizoids* *Jumping Jack*	£5 50 £5 50	6 10
Romik Software 272 Argyll Avenue Slough S11 4HE	*Spectra Smash*	£6 99	8
Silversoft London House 271/273 King Street London W6	*Muncher*	£5 95	—
Softek 12/13 Henrietta Street London WC2	*Firebirds*	£5 95	7

Single ship combat

***Peter Bartley** presents Alien Destroyer in the final part of his gameswriting series*

To round off the series, here is a games program utilising many of the ideas we have been considering over the past few weeks

The object of the game is to destroy as many of the alien fleet as possible in single ship combat You have a limited fuel supply and need one unit of energy to get back to your home base However, your laser is solar-powered and hence uses none of the ship's energy (ie you have unlimited firing) A five second warning sounds before you have to retire from the game

Your ship's sensors can give you certain information a tone sounds and the sights align when the enemy ship is within firing range When the ship can be hit the vulnerable portion is illuminated in green The ship turns red when in line of fire but cannot be hit When you are close enough to the enemy ship your navigation system will take over the aiming for you and 'lock-on

The controls of your ship are difficult to master They are *P=up*, *L=left*, *colon=right*, *full stop=down*, *K=fire* *@=track* (tracking mode the ship will always be moving in the last direction indicated, unless in tracking mode, when the ship will remain relatively stable) The difficulty lies in the fact that the motion of your craft is relative For example if you made the ship veer left, the enemy would appear to move right, and so on It's easier to just think of hitting the key which corresponds to the relative position of the enemy on the screen

The first program is a "loader — it simply befines the characters we'll be using in the game *Run* the 'loader' first then *New* it and *Load* the second program (though not before *Saving* them both first of course) Line 10 reduces the amount of memory Basic thinks it has, and line 20 reads the character data

The second program is the game itself Lines 10-110 are the initialisation The reversed *H* in line 10 is a special print character for those who missed the section in the fourth article of the series, here's how to obtain it When typing the line for the first time leave a space where the *H* should be Return the line, and move the cursor up and onto the space you left Type *"[RVS ON]'* and than hit *H* A reversed *H* should have appeared This character prevents lower case letters from being printed by accident. Line 20 defines the direction array for the enemy ship Line 110 colours the lines of fire and starts the timer Lines 120-310 are the main loop

Many of the lines in this program can be considered as working in pairs Lines 130 and 300 sound the alarm when the fuel is used up lines 170 and 200 move the ship and lines 205 and 290 move the direction arrow There are three subroutines (although two only are true subroutines) They are lines 400+ (final routine and highscore) 500+ (firing routine) and 600+ (the 'lock-on)

Other lines of importance 210 checks whether there is a target in the sights Lines 540 590 create the explosions I always prefer it when print statements are explained so line 140 has three spaces and three *[CSR BACK]*s in it. Line 640 is

"[10 CSR RT] [3 CSR DN] [SHIFT @] [SPACE] [SHIFT L] [CSR DN] [3 CSR LFT] [3 SPACES] [CSR DN] [3 CSR LFT] [SHIFT P] [SPACE] [SHIFT O]"

Line 670 is

[10 CSR RT] [3 CSR DN] [SPACE] [SHIFT –] [SPACE] [CSR DN] [3 CSR LFT] [SHIFT •••] [CSR DN] [3 CSR BK] [SPACE] [SHIFT] [SPACE]"

Note that both lines have *[RVS ON]* commands contained in them This is true of all the *Print* statements in the program except those contained in any of the lines 400-470 (remember the third article we haven't read their character data into Ram only our data from the loader program)

Main variables *A* gives the position of the ship *F* the position of the guidance arrow and *B* is the "general-purpose' variable

This program shows how simple ideas can produce a very playable game — try to add "little extras to it and then get to work on your own 'pet' ideas

If you do have a playable game or simply an interesting routine please don't hesitate to send it to *Popular Computing Weekly*, following the instructions given at the beginning of each Open Forum Think of all those other Vic users out there starved of programs And if that doesn't warm your heart, there's always the chance to make a bit of ready cash from your effort You have nothing to lose but your postage ■

Program 1

```
10 POKE52,27 POKE56,27 CLR
20 FORA=7168TO7231 READB POKEA,B NEXT
30 FORA=7424TO7431 POKEA,0 NEXT
40 DATA16,56,16,16,16,16,56,16
50 DATA60,66 153 231,165,153,90,60
60 DATA2,4,6,5,5,6,4,2
70 DATA64,32,96,160,160,96,32,64
80 DATA0 0,66,255 66,0,0,0
90 DATA0 0,0,193,34,28,0,0
100 DATA0 32,65,255,66,32 0,0
110 DATA52,65,181,66,149,132,105,86
```

Program 2

```
10 POKE36879,8 POKE36878,15 PRINT"▒▒▒▒"
20 POKE36869,255 D(0)=-22 D(1)=22 D(2)=-
   1 D(3)=1 TI$="000000"
100 PRINT"▒" A=7702+INT(RND(1)*404)
    POKE7701,230
110 FORB=38643TO38652 POKEB,2 NEXT
    POKE38653,5
120 POKE7911,0 POKE7955,0 POKE38421,INT
    (RND(1)*7)+1
130 IFVAL(TI$)>=55THENPOKE36874,200 IFTI
    $>="000100"THENGOTO400
140 PRINT"▒▒ENERGY    ▒▒▒"60-VAL(TI$)
150 PRINT"▒"TAB(11)"▒▒HITS "SC
170 POKEA,32 POKEA-1,32 POKEA+1,32
180 A=A+D(INT(RND(1)*4))+E IFA<7680+22
    THENA=A+484
190 IFA>8164+22THENA=A-484
200 POKEA 1 POKEA-1,2 POKEA+1,3
205 F=INT((A-7680)/22)*22+7701 IFA+1<>
    FANDA<>FANDA-1<>FTHENPOKEF,6 POKEF
    +30720,4
210 IFPEEK(7933)<>32THENPOKE36876,240
    POKE7911,4 POKE7955,4 POKE36876,0
215 IFPEEK(7933)=1THEN600
220 P=PEEK(197)
230 IFP=13THENE=22
240 IFP=45THENE=-1
250 IFP=37THENE=-22
260 IFP=21THENE=1
270 IFP=53THENE=0
280 IFP=44THENGOSUB500 IFX=1THENX=0
    GOTO100
290 POKEF,32 POKEF+30720,1
300 IFVAL(TI$)>=55THENPOKE36874,0
310 POKE198,0 GOTO120
```

```
400 POKE36874,0 FORB=0TO253 POKE7933+B,
    170 POKE38653+B,5 POKE7933-B,170
    POKE38653-B,5
410 NEXT POKE198,0 POKE36869,240 PRINT"
    ▒▒▒YOU SCORED ▒'SC
420 IFSC>HSTHENHS=SC PRINT"▒▒YOU HAVE THE
    HIGHSCORE▒▒PLEASE TYPE YOUR NAME" IN
    PUTC$
430 PRINT"▒▒"C$" HAS THE"
440 PRINT"▒HIGHSCORE WITH"HS
450 PRINT"▒▒▒ HIT A KEY TO RESTART "
460 GETA$ IFA$=""THEN460
470 SC=0 GOTO20
500 FORB=0TO0
510 POKE7923+B,5 POKE7942-B,5 POKE36876,
    241-B NEXT
520 FORB=0TO0 POKE7923+B,32 POKE7942-B,32
    POKE36876,241-B NEXT POKE36876,0
530 IFPEEK(7933)=32THENRETURN
540 A$=TI$
550 FORB=0TO9 POKE36877,141-B POKE7933+B,
    7 POKE7933-B,7 POKE7933-22*B,7
    POKE7933 +22*B,7
560 POKE7933+B,32 POKE7933-B,32 POKE7933
    -22*B,32 POKE7933+22*B,32 NEXT
570 SC=SC+50 X=1
580 FORB=15TO0STEP-.1 POKE36877,150-B
    POKE36878,B NEXT POKE36877,0
    POKE36878,15
590 TI$=A$ RETURN
600 B$=TI$
610 FORB=0TO0 POKE7923+B 4 POKE7943-B,4:
    POKE38643+B,1 POKE38663-B,1 POKE
    36877,225+B*2
620 POKE7923+B,32 POKE7943-B,32 NEXT
    POKE7931,4 POKE7935,4 POKE36877,0
630 PRINT"▒▒          ▒▒LOCKED ON▒▒
    " POKE36876,0 FORB=1TO20 NEXT
640 IFINT(G/5)=G/5THENPRINT"▒▒▒▒▒▒▒▒▒▒▒▒
    ▒▒▒▒ ▒▒▒▒▒     ▒▒▒▒▒ ▒"
650 IFPEEK(197)=44THENGOSUB500 SC=SC-20
    TI$=B$ X=0 GOTO100
660 PRINT"▒▒
    " POKE36876 240 FORB=1TO20 NEXT
670 IFINT(G/10)=G/10THENPRINT"▒▒▒▒▒▒▒▒▒▒
    ▒▒▒▒▒ | ▒▒▒▒──▒▒▒▒ | "
680 G=G+1 GOTO630
```

The rings of Saturn

***Maurice Gevin** presents the rings of Saturn for 16K Spectrum*

Through the telescope Saturn is the beautiful ringed planet that never fails to impress — be it beginner or expert alike. This program does the next best thing and probably represents the most accurate computer simulation of Saturn ever attempted on a home micro. It is possibly superior to many mainframe efforts with the known exception of NASA's Planetary Laboratories!

It features a full screen solid image with all hidden lines deleted and the globe and ring system drawn accurately to scale. The user may tilt the planet and ring system at any angle up to 90°. If 0° is *Input*, the planet is drawn as viewed directly over its equator with the rings shown edge-on. If 90° is *Input*, a polar view is presented with the ring system completely encircling the planet. You may select a northern or southern aspect for the tilt. An *Input* of s will show the underside of the rings and the equator and visible pole correct for this aspect.

The sequence of drawing the planet is as follows

1) Check image lobe rescale if tilt >43°
2) Draw globe correcting apparent oblateness for tilt
3) Draw equator correcting apparent oblateness for tilt
4) Draw semi transparent ring system
5) Trace nearest edge of rings across globe according to N/S aspect
6) Draw Cassini Division through ring system clockwise for N aspect
7) Delete Cassini Division if "behind" planet
8) Plot visible pole position correcting (apparent oblateness for tilt

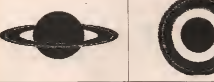
The program contains an option to *Copy* the completed picture to the ZX printer or to *Save* the image onto tape with the *Screen* command. The latter is simplicity itself — it is only necessary to press "p" (for picture) and start the recorder to *Save* the picture you have created. The angle of tilt is automatically *Saved* in the file name: eg, "sat −23.4". To recreate the picture enter *Load* "sat −23.4" *Screen* and the Spectrum will search and display the appropriate image off of tape.

Unlike some uninformed computer presentations of this planet, the globe is not circular (except for the polar view) and so the *Circle* command cannot be used to draw the planet. This oval (or correctly termed oblate spheroid) shape is due to Saturn's rapid axial rotation in 10h 14m (Saturn's day), causing the equatorial "bulge" and polar "flattening". The Spectrum *Draws* the globe and ring system via the *Plot* command, using a rapid ellipse routine. In the case of the globe, the reduction in oblateness, as it is called, from 10 percent to zero (full circle) is applied progressively through the change of tilt from 0° to 90°. Similarly the position of the equator and visible pole are correctly located according to the tilt of the planet and the oblateness as presented.

As seen from Earth, the appearance of the planet is limited to a maximum tilt of 26.73° (ie, Saturn's axial tilt to its orbit about the Sun) in both north or south directions, plus or minus 0.49° depending on the relative positions of Earth and Saturn in their orbits at the time. Thus any tilt in excess of 28° will represent a viewpoint other than from Earth!

The Rem statements show the general structure of the program. In the case of *Drawing* the globe and rings, it is only necessary to calculate the outline of one quadrant of the ellipse and to mirror this in the remaining three quadrants by *Drawing* each quadrant sequentially. Such a routine ensures the *Drawing* is executed rapidly with the minimum of calculation to slow the program down. In the case of the routine to *Draw* the Cassini Division in the ring system, I have chosen to *Plot* one complete ellipse and you will note how relatively slow, though satisfying, this proves to be.

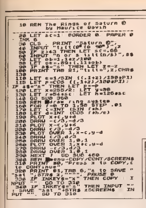
Because the whole of the above programs relies on the ability to *Draw* ellipses rapidly I have included as an addendum routine the short program called *Solid Ellipse*. It can easily be incorporated into your program if you wish to *Draw* these precise shapes. The variable *y* is used here to control both the vertical *y* coordinate *Plot* position and the maximum radius of the ellipse (called the semi-major axis). The routine is short enough to "tinker with" and find out precisely how it works, perhaps with your own value in place of *y* in lines 110 and 120. ■











```
  10 REM The Rings of Saturn ©
         by Maurice Gavin
-------------------------------
  20 LET sc=1: BORDER 0: PAPER 0
: INK 6
  30 CLS : PRINT "Saturn ©",
  40 INPUT "tilt(0° to 90°)",z
  50 IF z>43 THEN LET sc=.66
  60 INPUT "n or s tilt(n/s)",a$
  70 LET ob=1.1*z/100
  80 LET oe=.89+(.11*ob)
  90 IF a$="s" THEN LET z=-z
 100 PRINT TAB 21,"tilt=",z,CHR$
 130
 110 LET e=1/SIN ((.1+z)/180*PI)
 115 LET p=COS ((.1+z)/180*PI):
IF a$="s" THEN LET p=-p
 120 LET x=255/2: LET y=80
 130 LET r=54*sc: LET h=126*sc
 140 GO SUB 360
 150 REM ■draw ring system
 160 FOR f=0 TO 1.58 STEP .01
 170 LET c=INT (SIN f*h)
 180 LET d=INT (COS f*h/e)
 190 PLOT x+c,y+d
 200 DRAW -c/3,-d/3
 210 PLOT x-c,y+d
 220 DRAW c/3,-d/3
 230 PLOT OVER 1,x-c,y-d
 240 DRAW c/3,d/3
 250 DRAW OVER 1,0,1
 260 PLOT OVER 1,x+c,y-d
 270 DRAW -c/3,d/3
 280 DRAW OVER 1,0,1
 290 NEXT f: GO SUB 460
 300 REM ■menu-COPY/CONT/SCREEN$
 310 PRINT #0,"Press x to COPY,c
to CONTinue"
 320 PRINT #1,TAB 6,"s to SAVE "
"sat ",STR$ z,"""": PAUSE 0
 330 IF INKEY$="x" THEN COPY : I
NPUT "": GO TO 310
 340 IF INKEY$="s" THEN INPUT ""
: SAVE "sat "+STR$ zSCREEN$ : IN
PUT "": GO TO 310
```

```
 350 RUN
 360 REM ■draw oblate globe
 370 FOR f=0 TO 1.420 STEP .019
 380 LET a=INT (SIN f*r)
 390 LET b=INT (COS f*r*oe)
 400 PLOT x+a,y+b: DRAW 0,-b*2
 410 PLOT x-a,y+b: DRAW 0,-b*2
 420 NEXT f
 430 REM ■draw equator
 440 FOR f=PI*.5 TO PI*1.5 STEP
.1: PLOT OVER 1,x+SIN f*r,y+COS
f*r/e: NEXT f: RETURN
 450 REM ■draw Cassini Division
 460 LET cd=2.1
 470 FOR f=0 TO PI*2 STEP .03: P
LOT OVER 1,x+SIN f*r*cd,y+COS f*
r*cd/e: DRAW OVER 1,2,0: NEXT f
 480 REM ■delete CD behind globe
 485 IF ABS z>26 THEN GO TO 570
 490 FOR f=0 TO 1.42 STEP .01
 500 LET a=INT (SIN f*r)
 510 LET b=INT (COS f*r*oe)
 520 IF a$="s" THEN LET b=-b
 530 PLOT x+a,y: DRAW 0,b
 540 PLOT x-a,y: DRAW 0,b
 550 NEXT f
 560 REM ■plot visible pole
 570 PLOT OVER 1,x,y+r*p*oe
 580 RETURN
9990 SAVE "saturn1"
```

```
   0 PRINT "solid ellipse ©"
  10 REM    by Maurice Gavin
-------------------------------
  20 INPUT "tilt",z: PRINT "tilt
=",z,"°"
  30 LET e=SIN ((.1+z)/180*PI)
  40 LET x=255/2: LET y=175/2
 100 FOR f=0 TO PI/2 STEP .012
 110 LET a=INT (SIN f*y)
 120 LET b=INT (COS f*y*e)
 130 PLOT x-a,y+b: DRAW 0,-b*2
 140 PLOT x+a,y+b: DRAW 0,-b*2
 180 NEXT f
 200 OVER 1: PLOT 0,y: DRAW 255,
0: PLOT x,0: DRAW 0,175: OVER 0
```

Circular logic

***Michael Batty** shows how to draw circles and ellipses in the first of a three-part series on computer graphics*

Let's begin with some ideas about how to draw regular shapes such as circles and ellipses which comprise the basic elements of computer art The usual way to draw a circle is to calculate points around its circumference and draw between them The X, Y co-ordinates of each point are given by the formulas

X = R*COS(TH) and Y = R*SIN(TH)

where R is the radius and TH the angle from the horizontal measured counter-clockwise If we vary TH regularly from 0 to 360 degrees (or 2*PI radians), we trace out the points which lie on the circumference.

A circle is really a special form of ellipse where the vertical and horizontal axes are the same length If we change these lengths by replacing R in the above formulas by XX, the 'radius of the X axis and YY, the radius of the Y axis we generate points defining an ellipse Program 1 enables you to do this

Try values for XX and YY between 100 and 300 to start with If you wish to leave each image on the screen delete line 180

Program 1 is really too slow for computer art where speed is of the essence This is because the sine and cosine functions have to be evaluated for each set of X Y co-ordinates It is possible however to compute these functions only once for a small fixed angle (DT) and to then use a recursive formula based on trigonometric addition rules to generate the sequence of X, Y values This technique is used in Program 2 Run it and see that the same shapes are drawn over three times as fast as in Program 1

We now need to paint or fill these shapes and we can make use of the triangle fill command *PLOT85* of BBC Basic If you insert line 120 *MOVE 0 0* and replace line 150 with *PLOT85,X Y* in Program 1 and 2 these programs become the conventional ellipse filling algorithms used in most simple graphics

However, these are also too slow and a faster technique is to fill the shape in the same way you might shade it manually, using vertical up and down strokes In Program 3 this technique is used Note that the fill is from right to left as though you were left handed because of the way circular angles are measured

Also observe that only the points defining the top half of the shape are computed Faster fill routines exist even in Basic but this technique is necessary for later work

We now have quite a fast method for filling an ellipse and we can already generate some interesting computer art Program 4 paints random sized ellipses in random colours at random positions on the screen and the illustration shows what can be achieved To get some weird and wonderful effects alter the operation of the *Gcol* statement in line 90 and use MODE2 to generate 16 colours

Next week, we will show how these shapes can be rotated to generate more formal designs ■



PROGRAM 1

```
 10 REM Slow Ellipse Drawing
 20 MODE1
 30 VDU29,640;512;
 40 REPEAT
 50   INPUT"RADIUS OF X AXIS = ",
      XX
 60   INPUT"RADIUS OF Y AXIS = ",
      YY
 70   TIME=0
 80   N=60:DT=2*PI/N
 90   MOVE XX,0:TH=0
100   FOR I%=1 TO N
110     TH=TH+DT
130     X=XX*COS(TH)
140     Y=YY*SIN(TH)
150     DRAW X,Y
160     NEXT I%
170   PRINT"TIME TAKEN = ";TIME
180   A=GET:CLS
190   UNTIL FALSE
200 END
```

PROGRAM 2

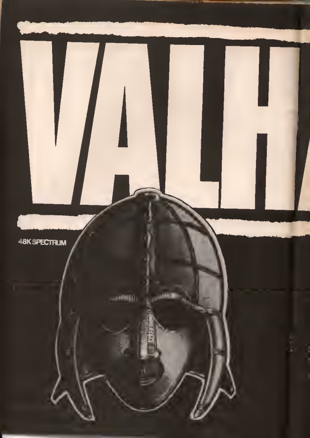
```
 10 REM Fast Ellipse Drawing
 20 MODE1
 30 VDU29,640;512;
 40 REPEAT
 50   INPUT"RADIUS OF X AXIS = ",
      XX
 60   INPUT"RADIUS OF Y AXIS = ",
      YY
 70   TIME=0
 80   N=60:DT=2*PI/N:A=XX/YY
 90   X=XX:Y=0:MOVE X,Y
100   C=COS(DT):S=SIN(DT):SS=S/A:
      S=S*A
110   FOR I%=1 TO N
130     T=X*C-Y*S
140     Y=Y*C+X*SS:X=T
150     DRAW X,Y
160     NEXT I%
170   PRINT"TIME TAKEN = ";TIME
180   A=GET:CLS
190   UNTIL FALSE
200 END
```

PROGRAM 3

```
 10 REM Fast Draw,Fast Fill
 20 MODE1
 30 VDU29,640;512;
 40 REPEAT
 50   INPUT"RADIUS OF X AXIS = ",
      XX
 60   INPUT"RADIUS OF Y AXIS = ",
      YY
 70   TIME=0
 80   N=30:DT=PI/N:A=XX/YY
 90   C=COS(DT):S=SIN(DT):SS=S/A:
      S=S*A
100   X=XX*C:Y=YY*S
110   MOVE XX,0:MOVE X,Y:PLOT85,
      X,-Y
120   FOR I%=2 TO N-1
130     T=X*C-Y*S
140     Y=Y*C+X*SS:X=T
150     PLOT85,X,Y:PLOT85,X,-Y
160     NEXT I%
170   PLOT85,-XX,0
180   PRINT"TIME TAKEN = ";TIME
190   A=GET:CLS
200   UNTIL FALSE
210 END
```

PROGRAM 4

```
 10 REM Random Ellipese
 20 REM (C)Michael Batty,1983
 30 MODE1
 40 VDU19,0,4;0;19,1,5;0;
 50 VDU19,2,6;0;19,3,7;0;
 60 VDU5
 70 DT=PI/30:C=COS(DT):S=SIN(DT)
 80 REPEAT
 90   VDU29,RND(1279);RND(1023);
100   GCOL0,RND(3)
110   XX=20+RND(150):YY=20+RND
      (150)
120   PROCSHAPE(XX,YY,C,S)
130   UNTIL FALSE
140 END
150 DEFPROCSHAPE(XX,YY,C,S)
160 A=XX/YY:SX=S/A:SY=S*A
170 X=XX*C:Y=YY*S
180 MOVE XX,0:MOVE X,Y:PLOT85,X,-Y
190 FOR I%=2 TO 29
200   T=X*C-Y*SY
210   Y=Y*C+X*SX:X=T
220   PLOT85,X,Y:PLOT85,X,-Y
230   NEXT I%
240 PLOT85,-XX,0
250 ENDPROC
```


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PCWK 36

A bit-mapped screen

The first in a two-part series on hi-res graphics

Though the possibilities provided by user-defined characters and sprites are almost limitless the 64 does provide yet another major graphics mode bit-mapped graphics What this means is that rather than being able to address a minimum of one of the 1 000 character squares on the normal screen the user is able to set any individual pixel (short for picture element) or dot on the screen In this mode line drawings and curves can be drawn on the screen though to make the fullest use of it you will need to get hold of the graphics extension cartridge for the 64 which will provide you with a variety of flexible graphics commands

To understand the program given here it is necessary to know a little about the way the bit-mapped screen is set up The screen itself contains 320*200 separate positions, a total of 64 000 In order to store each of these separately, 8 000 bytes of memory are needed, providing 64 000 individual bits Each of the standard character positions requires eight bytes (the 8*8 grid that we used for user-defined graphics) Starting from the top left-hand corner of the screen the first 8 (0 7) bytes of the screen memory are used to create what would be on the normal screen the first character position The second eight bytes form the second 8*8 grid and so on along the line Since there are 40 character positions in a line, each line takes 320 bytes In actual fact because the bit-mapped mode enables individual pixels to be addressed this line of 8*8 grids is capable of holding eight single pixel thickness lines (though if you drew them all it would look like a solid bar)

The 8K of memory necessary to hold the bit-mapped screen is obviously not storable in the normal 1K screen memory nor, in fact, can it even use that area as a part of its area since 1024 to 2023 is used to store colour information for the bit-mapped screen The solution adopted in the program that follows is to locate the screen beginning at 8192 leaving 8K of memory for the Basic program with the option of relocating Basic if the program is developed and lengthened Using the program given here you will be able to use the bit-mapped screen as a sketch-pad using either the cursor move arrows or a simple line-drawing algorithm to create a design on the screen.

Hi-Res	Table of Variables
DX	Distance between ends of line along X axis
DY	Distance between ends of line along Y axis
FN PE	The value that must be POKEd into PP to erase pixel X,Y
FN PP	The location of the byte in which pixel X,Y falls
FN PV	The value that must be POKEd into PP to set pixel X,Y
MO	The current mode of the program.
SC	Start of screen
SL	The slope of the line to be drawn
X1,X2	X co-ordinates of ends of line to be drawn
Y1 Y2	Y co-ordinates of ends of line to be drawn

Module 3 4 1

This module configures the screen memory for the bit-mapped mode, defines some useful functions and clears the high resolution screen

Commentary

Line 10025 The POKEs in this REM statement are not necessary for the running of this program They are included in order that if you wish to expand the program in such a way that it may overrun the screen at 8192 and onwards you will have the necessary information to relocate Basic As with the Sprites program the POKEs should be included in a loader program which is run BEFORE the main program The program as given here works happily within the 8K of memory up to 8192 — there is *no* necessity even to set a limit to the top of Basic

Lines 10027-10029 The use of these functions is given in the table of variables.

Line 10030 53272 is the register normally used to control where the VIC II looks for character data, in this case it will dictate the beginning of the bit-mapped screen POKEing 8 in here sets the screen start to 8192 POKEing 53265 with 32 sets the bit mapped mode

Lines 10035-10040 In Line 10022, the user was given the option of clearing the screen During the development of the program, when the program is stopped and RUN-RESTORE pressed alterations can be made to the program without affecting the contents of the screen at all On running the program again it saves time not to have to clear the 8000 bytes

Line 10050 This line clears the normal screen memory area which is now employed to hold the colour data for each of the 1000 normal character positions

Testing Module 3 4 1

On first running the program, the screen should immediately fill with garbage Gradually this will clear leaving a screen which may still be covered with coloured squares corresponding to the position of characters on the normal mode screen These too should then begin to clear and the screen be set to white When the module is finished press RUN and RESTORE to return to normal mode ■

Continued next week

MODULE 3.4.1

```
10000 REM********************************
10010 REM INITIALISE HI-RES SCREEN
10020 REM********************************
10022 CL$="" INPUT "CLEAR SCREEN (Y/N)
 ",CL$
10025 REM POKE 44,64 POKE 43,1 POKE 1630
4.0 CLR
10027 DEF FNPP(X)=SC+320*INT(Y/8)+8*INT(
X/8)+(Y AND 7)
10028 DEF FNPV(X)=PEEK(FNPP(X)) OR (2↑(7
-(X AND 7)))
10029 DEF FNPE(X)=PEEK(FNPP(X)) AND (255
-2↑(7-(X AND 7)))
10030 POKE 53272,(PEEK(53272)OR 8 POKE
53265 PEEK(53265) OR32 SC=8192
10035 IF CL$="N" THEN 10050
10040 FOR I=SC TO SC+7999 POKE I,0 NEXT
10050 FOR I=1024 TO 2023 POKE I,6*16+12
NEXT
10060 MO%(0)=2 MO%(1)=5 MO%(2)=10
```

Functioning well . . .

David Prins presents a numerical analysis technique for approximating functions

This program uses a numerical analysis technique, known as the Newton polynomial interpolation method, in order to approximate a function by a polynomial.

In general, if data is known about a function at N different points, then a unique polynomial exists of degree $(N-1)$, which models the function exactly at the N given points and approximately at other points. This approximation is very good for functions which are well behaved (ie, continuous, polynomial-like) and works best in the neighbourhood of the given data. But, if data is only known at, for instance, $x = 1, 2, \ldots 10$, you should not rely too much on the polynomial approximation at say $x = 1000$, which is nowhere near the given points.

The data points you enter will probably have been obtained from a science experiment or simulation, but the program can also be used to answer school maths questions regarding straight lines and quadratic curves which pass through given points.

It is important to note that approximations given by the program are only useful for "well behaved" polynomial or polynomial-like functions and for approximations in the region where the original data was given. Also, you must not enter any point more than once in any one set of data.

Program notes

40-210	Set up required arrays and input the known data
220-340	Make any corrections required
500-610	Calculate the polynomial coefficients checking that all points entered are different
620	Call the evaluation subroutine
630-650	See if another evaluation is required — if yes then *Goto* 620, else *Stop*
700-790	The Evaluation subroutine — this asks for input of the evaluation point and prints the result
1000-1010	Simple subroutine to get "Y" or "N" from the keyboard

Variables

N	Number of data points given
X(N) F(N) C(N)	Arrays to hold data points, function values at data points and polynomial coefficients respectively
I,J	Used as loop counters and array subscripts
A$	Holds result of INKEY$
X,F	Hold correction data — X is later re-used as the value at which approximation occurs
L,D	Used in polynomial coefficient calculation
V	The value which is the result of the program

```
10 REM APPROXIMATION USING INTER
   POLATING POLYNOMIALS.
20 REM ALL POINTS ENTERED MUST BE
   DIFFERENT.
30 REM
40 CLS:PRINT"HOW MANY DATA POINTS"
50 PRINT"DO YOU WANT TO ENTER";
60 INPUT N
70 CLS:PRINT"WHEN PROMPTED, ENTER A
   POINT AND"
80 PRINT"THE VALUE OF THE FUNCTION AT"
90 PRINT"THE POINT, SEPARATED BY A
   COMMA.":PRINT
100 PRINT"FOR EXAMPLE, TO ENTER THAT
    THE"
110 PRINT"FUNCTION HAS THE VALUE
    4.2 AT"
120 PRINT"THE POINT 2.0"
130 PRINT"ENTER      2.0,4.2":PRINT
140 PRINT"IF YOU MAKE A MISTAKE YOU
    CAN"
150 PRINT"CORRECT IT AT THE END."
160 REM
170 DIM X(N),F(N),C(N)
180 FOR I=1 TO N
190 PRINT:PRINT"POINT NO.";I;
200 INPUT X(I),F(I)
210 NEXT I
220 PRINT:PRINT"DO YOU WANT TO MAKE"
230 PRINT"ANY CORRECTIONS? (Y/N)":
    GOSUB 1000
240 IF A$="N" THEN 500
250 PRINT"WHEN PROMPTED, ENTER
    CORRECTIONS"
260 PRINT"BY TYPING THE NO. OF THE
    POINT"
270 PRINT"YOU WANT TO CORRECT AND ITS"
280 PRINT"CORRECTED VALUE AND
    FUNCTION"
290 PRINT"VALUE, SEPARATED BY COMMAS.
    ":PRINT
300 PRINT"TO END CORRECTIONS,
    TYPE 999,0,0"
310 PRINT:PRINT"POINT NO.";
320 INPUT I,X,F
330 IF I=999 THEN 500
340 X(I)=X:F(I)=F:GOTO 310
500 FOR I=1 TO N:C(I)=F(I):NEXT I
510 IF N=1 THEN 620
520 FOR I=1 TO N-1
530 L=C(1)
540 FOR J=1 TO N-I
550 D=X(I+J)-X(J)
560 IF D=0 THEN PRINT"YOU ENTERED THE
    POINT",X(J);"MORE THAN ONCE.":STOP
570 C(J)=(C(J+1)-L)/D
580 L=C(J+1)
590 NEXT J
600 C(N-I+1)=L
610 NEXT I
620 GOSUB 700
630 PRINT:PRINT"DO YOU WANT ANOTHER
    EVALUATION"
640 PRINT"USING THE SAME DATA POINTS?
    (Y/N)":GOSUB 1000
650 IF A$="Y" THEN 620 ELSE STOP
700 CLS:PRINT"ENTER THE VALUE AT
    WHICH YOU"
710 PRINT"WANT TO APPROXIMATE THE
    FUNCTION";
720 INPUT X
730 V=C(1):IF N=1 THEN 770
740 FOR I=2 TO N
750 V=C(I)+(X-X(I))*V
760 NEXT I
770 PRINT"APPROXIMATE FUNCTION VALUE"
780 PRINT"AT";X;"IS";V
790 RETURN
1000 A$=INKEY$:IF A$="" THEN 1000
1010 IF A$="Y" OR A$="N" THEN RETURN
     ELSE 1000
```

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the _Program of the Week_ double our new fee of £6 for each program published.

Target Practise

on Dragon

This is a simple target shooting game in which a cowboy has to fire at a moving target. The target randomly moves from top to bottom and vice-versa. Both the cowboy and the target are stored in arrays 'A' and 'B' respectively. Since using the command '*Poke* 65495 0' to speed up the game disables the cassette interface. Unless you escape from the program in the method allowed within the program itself you will have to press the reset button before using the interface to either save or load programs directly after playing.

There are 20 targets to hit and you are marked according to how many you manage to hit. The up/down arrows move the cowboy up and down. The shift keys are used to fire. It does not matter if you let the target pass, as it will reappear again with no penalty. If your Dragon will not accept the *Poke* leave it out.

Variables

S	Speed of the target
F	Determines direction of target travel
H	Number of target
K	Score out of 20
X Y	Co-ordinates of cowboy
o G	Co-ordinates of Bullet
P T	Co-ordinates of target
ARRAY A	Cowboy
ARRAY B	Target

```
10 REM
20 REM
30 REM
40 REM
50 REM
60 REM
70 REM
77 CLS
60 PRINT @ 64," SHOOTING PRACTICE" PRINT
   @ 128," BY D HASWELL'
90 SCREEN0,1
100 FOR T = 1 TO 2000 NEXT
110 CLS8 PRINT @ 64 "THE UP AND DOWN
   ARROWS MOVE THE
   COWBOY  PRINT PRINT"TRY TO HIT THE
   MOVING TARGET  PRINT PRINT 'YOU ONLY
   HAVE 1 SHOT PER TARGET  PRINT PRINT
   "THERE ARE 20 TARGETS TO HIT
   PRINT PRINT"YOU NEED NOT HIT THE
   TARGET FIRST TIME!  "THERE IS NO
   PENALTY FOR LETTING IT
   PASS  PRINT"USE
   'SHIFT' TO FIRE '
130 SCREEN 0,1
140 FOR T = 1 TO 8000 NEXT
150 POKE 65495,0
160 K = 0
170 DIMA(20 30)
160 DIMB(30,30)
190 PMODE,1 PCLS
200 DRAW"BM3 5;R5D2L7R9L2D6L5NU6L2D10
   R7U10D3L4R10L2U2R4BM2,24,
   R3D12R3L6U12
210 GET(0,0) - (17,40),A,G
220 PCLS
230 CIRCLE(10 10),3
240 GET(0 0) - (30 30),B G
244 REM BOTH COWBOY AND TARGET NOW
   STORED
250 PCLS
260 SCREEN1,1
270 FOR H = 1 TO 21
260 PCLS
290 LINE(4,4) - (250 186) PSET,B
295 REM BORDER
300 X = 6 Y = RND(50) + 50 P = RND(100) + 50
310 O = 17
320 L = 0 F = RND(10000) - 5000
330 F = F/1000
340 REM DETERMINE DIRECTIONS OF TARGET
350 IF F < 0 THEL = 190 ELSEL = 0
370 S = RND(3) + 3
380 S = (SGN(F) * S)
390 FOR T = L TOABS(L + ( - 190))
400 PUT(X,Y) - (X + 17,Y + 40),A,PSET
410 IF PEEK(135) = 10 THEN Y = Y +3 PLAY
   ' T155O3C
420 IF PEEK(135) = 94 THEN Y = Y - 3 PLAY
   "T155O3C'
430 IF PEEK(65280) = 191 THEN L = 1 G = Y +
   14 PLAY' O5T155V30GV25FV20EV15DV10
   CV5C'
440 IF PEEK(65260) = 255 THEN POKE135,0
450 IF L = 1 THEN PSET(O G)
460 IF Y > 144 THEN Y = 144
470 IF O > P - 2 AND O < P + 25 AND G > T AND
   G < T + 18 THEN K = K + 1 CIRCLE(P,T),10
   CIRCLE(P T) 15 PLAY
   "T20O1V30GV25FV20EV15DV10
   CV5C  PCLS NEXTH GOTO560
460 IF Y < 6 THEN Y = 8
490 IF O > 250 THEN O = 17 L =
   0 PLAY"O1T155CCCC  NEXTH
500 PRESET (O G)
510 IF L = 1 THEN O = O + 15
520 PUT (P T) - (P + 30,T + 30),B PSET
530 IF H = 21 THEN 560
540 NEXTT
550 GOTO320
560 CLS
570 PRINT @ 64,"YOU SHOT"K"TARGETS OUT
   OF 20!'
577 PLAY"T30V20CDEFGAB"
560 IF K < 10 THEN PRINT' YOU WOULD NEVER
   LIVE IF YOU HAD ',"TO DRAW FOR YOUR
   LIFE!
586 IF K > 18 THEN PRINT' YOU DRAW 'EM GOOD
   COWBOY! '
590 FOR J = 1 TO 2000 NEXT
600 PRINT @ 460, 'HIT ANY FOR ANOTHER
   GAME  , ' OR HIT 'E  TO END
610 POKE 135 0
620 A$ = INKEY$ IF A$ = '  ' THEN 620
640 IF A$ = 'E' THEN POKE 65494,0 END
650 RUN
```

Target Practise
by D Haswell

Maze

on Vic20

The program prints a random maze and the player takes the form of a diamond at the top of the screen. The object is to reach the bell at the bottom of the screen without colliding with a wall in the least number of moves.

On most mazes that the computer forms it is impossible to reach the bell without pressing the 8 key. When this is pressed the maze immediately surrounding the diamond is demolished. However, using this feature increases your number of moves by four.

This function can only be used three times so that a level of skill is required from the player. When you reach the bell you are informed of your score and the lowest number of moves it has been completed in so far.

The program incorporates good colour and sound.

Program notes

10-160	Set screen, draw maze
170-300	Move player, play note
551-570	Plays musical notes if you hit a wall
600-640	Congratulates you when you have traversed the maze
1000-1040	Destroys maze
1049-2000	Plays music

All curser controls are in lower case.

```
1 rem*******maze*****
2 rem written by a.morris
3 rem  date:28/2/83
5 rem
6 rem
7 rem
8 rem   set variables
9 rem*****************
10 print"■":s=100000
20 v=0:m=0
30 e=int(22*rnd(1)+7702)
40 h=int(22*rnd(1)+8164)
49 rem print heading
50 print"********■maze■*********"
60 print"   n:-down     u:-up"
70 print"   h:-left     j:-right"
75 print"        8:-demolish"
80 print"**********************"
90 fort=0to5000:nextt:print"■"
99 rem   draw maze
100 poke36879,0
110 fora=1to250
120 b=int(462*rnd(1)+7724)
130 pokeb,91
140 nexta
150 pokeh,81:gosub1100:geta$
151 pokeh,81:geta$
160 pokee,90
170 ifa$="n"theng=22:goto250
180 ifa$="u"theng=-22:goto250
190 ifa$="h"theng=-1:goto250
200 ifa$="j"theng=1:goto250
210 ifa$="8"thengosub1000
220 goto151
250 m=m+1
251 poke36878,15:poke36875,215
252 fort=1to200:next:poke36878,0
260 pokee,32:e=e+g
270 ifpeek(e)=91then551
280 pokee,90
290 ife=hthen600
300 goto151
551 poke36878,15:forw=1to6
552 readn:poke36875,n:forr=1to200:
    next
553 data135,143,147,151,159,163
556 nextw
557 poke36878.0:restore
558 poke36879,27
559 print"■you hit a wall!"
560 input"another game(y/n)";g$
570 ifg$<>"y"thenprint"■thanks for
    the game":end
580 print"■"
590 goto20
600 poke36879,27:print"■■■■■■■■■■■
    well done!you made it!"
601 poke36878,0:poke36878,15
602 ford=1to20
603 hj=int(rnd(1)*50)+175
604 poke36875,hj:poke36879,hj
605 fort=1to100:nextt
607 nextd
608 poke36878,0
609 poke36879,27:print"■■well done!
    you made it!"
610 print"in "m" moves."
620 ifm<sthens=m
630 print"least moves= "s
640 fort=1to1000:next:goto560
1000 ifv<3thengoto1020
1010 goto151
1020 pokee+1,32:pokee-1,32
1021 pokee+22,32:pokee-22,32:v=v+1:
     m=m+4
1022 poke36878,15:poke36875.255
1023 fort=1to400:nextt
1024 poke36878,0
1040 return
1049 rem**************
1050 rem*play tune****
1051 rem**************
1100 forty=1to27
1110 poke36878,15
1120 readc,z
1130 poke36875,c
1140 fort=1toz:nextt
1150 poke36878.0
1160 nextty
1170 restore:return
1180 data217,400.213.400,223,400
1190 data227.200,234,200,230,400
1200 data227.200.234,200,230.400
1210 data223,400.227,400,217,400
1220 data213,600
1230 data223,400
1240 data227,200,234,200,230,400
1250 data227,200,234,200,230,400
1260 data223,400,227,400.217,400
1270 data213,600,227,400,217,400,
     213,600
2000 end
3000 rem**************
```

Maze
by A Morris

Harrier Pilot

on Spectrum

The cockpit of the aircraft is filled with rows of flashing lights, silently signalling their vital messages to you, but your steel blue eyes are darting from your Artificial Horizon/Altimeter to your Radarscope as you fight for control of your £7m craft. Your fuel gauge indicates that you have only 60 seconds fuel remaining and the cross that indicates the ship's position, only 85ft below you, won't keep steady.

Only 20ft altitude now and your breath quickens as your Artificial Horizon/Altimeter shows you to be steady, level and slowly dropping. Suddenly your eyes widen in disbelief, your Radarscope shows that a gust of wind has blown you to one side, can you bring your Harrier back above the small ship before you crash into the sea . . . ?

Program notes

40	Zero best score
50-100	Draw screen display
110	Set variables
120-170	Read keyboard
180	Erase previous screen image
190 200	Wind random factor
210-250	Set new values for new screen display
260	Fuel gauge
270-320	Check for end game
330	Print new screen image
340-370	Set new incident factors
380-410	Screen image subroutine
420 510	Different endings to game

Variables

fu — fuel
rd — rate of side drift
m — x (Radarscope)
n — y (Radarscope)
ra — rate of ascent
p — degree of tilt (0-level)

```
   5 REM ************************
  10 REM *** HARRIER PILOT ***
  20 REM *** BY CS JONES    ***
  30 REM ************************
  40 LET bs=0
  50 BORDER 0  PAPER 0: INK 7· C
LS
  60 RESTORE 70  FOR c=21 TO 0 S
TEP -2  READ a$  PRINT AT c,6,a$
  NEXT c
  70 DATA "=000=","-010-","-020-
","-030-","-040-","-050-","-060-
","-070-","-080-","-090-","-100-
"
  80 PLOT 135,0  DRAW 0,175  DRA
W 120,0  DRAW 0,-175  DRAW -120,
0
  90 PLOT 130,83. DRAW 118,0. PL
OT 195.0  DRAW 0,174
 100 FOR a=10 TO 12  PRINT AT a,
23,"   ": NEXT a
 110 LET fu=21: LET rd=0  LET a=
190  LET n=83· LET ra=0  LET cy=
140  LET p=0  GO TO 230
 120 LET a$=INKEY$
 130 IF a$="" THEN GO TO 180
 140 IF a$="0" THEN GO TO 350
 150 IF a$="8" THEN GO TO 340
 160 IF a$="6" THEN GO TO 360
 170 IF a$="7" THEN GO TO 370
 180 GO SUB 380
 190 LET z=INT (RND*100)  IF z<3.
0 THEN LET p=p-.05  LET rd=rd-1
 200 IF z>60 THEN LET p=p+.05  L
ET rd=rd+1
 210 LET a=a-rd
 220 LET cy=cy+ra
 230 LET x=103+15*(COS (p+2*PI))
 240 LET y=cy+15*(SIN (p+2*PI))
 250 LET a=103-x. LET b=cy-y
 260 LET fu=fu-.17  INK 2  PRINT
 AT 21-fu,15, INVERSE 1."█"  INV
ERSE 0  INK 7
 270 IF y+2*b<0 THEN LET y=0
 280 IF y<=1 AND a<105 OR y<=1 A
ND a>195 THEN GO TO 490
 290 IF y<=1 AND ra<-2 THEN GO T
O 430
 300 IF y<=1 THEN GO TO 430
 310 IF a<135 OR a>245 OR n<10 O
R n>165 THEN GO TO 480
 320 IF fu<=0 THEN GO TO 500
 330 GO SUB 380  GO TO 120
 340 LET p=p+.05. LET rd=rd+1. G
O TO 180
 350 LET p=p-.05  LET rd=rd-1· G
O TO 180
 360 LET ra=ra-1  GO TO 180
 370 LET ra=ra+1  GO TO 180
 380 PLOT OVER 1,x,y  DRAW OVER
1,2*a,2*b  DRAW OVER 1,b,-a
 390 PLOT OVER 1,x-72,y: DRAW OV
ER 1,2*a,2*b· PLOT OVER 1,x-72,y
  DRAW OVER 1,b,-a
 400 PLOT OVER 1,a,n. DRAW OVER
1,10,0  PLOT OVER 1,a+5,n+5  DRA
W OVER 1,0,-10
 410 RETURN
 420 INVERSE 1· CLS  PRINT " YO
U CRASHED INTO THE SHIP "  BEEP
2,5  GO TO 510
 430 LET fu= INT fu. PAPER 2  IN
K 6  FLASH 1· CLS
 440 PLOT 0,0. DRAW 255,175  PLO
T 255,0  DRAW -255,175  FOR a=20
 TO 80 STEP 10  BEEP .1,20  CIRC
LE 127,87,a  NEXT a  PRINT AT 10
,13,"LANDED";AT 11,13,"SAFELY"
FLASH 0
 450 FOR a=1 TO 20  BEEP .1,20·
BEEP .1,30  NEXT a
 460 PAPER 0  INK 7  INVERSE 1·
CLS  PRINT " YOU LANDED SAFELY
"  PRINT · PRINT " SALVAGE COSTS
 AGREED AT £7m. "  IF fu>bs THEN
 LET bs=fu
 470 GO TO 510
 480 INVERSE 1. CLS  PRINT " YO
U HAVE MOVED OUT OF RANGE ". BEE
P 2,5  GO TO 510
 490 INVERSE 1  CLS  PRINT " YO
U HAVE CRASHED INTO THE SEA "  B
EEP 2,5  GO TO 510
 500 INVERSE 1. CLS  PRINT " YO
U HAVE RUN OUT OF FUEL "  BEEP 2
,5
 510 PRINT : PRINT " YOUR BEST S
CORE IS NOW ",bs," ". PRINT  PR
INT " ANOTHER TRY ? "  INVERSE 0
  INPUT b$  IF b$="y" THEN GO TO
 50
```

Harrier Pilot
by Colin Jones

Colour Sin

on Oric

This program illustrates how impressive graphic effects can be achieved with only a few lines of program

```
10 HIRES
20 FORI=1 TO 199·CURSET0,1,0
25 IF I<100 THEN FILL 1,1,16
30 FILL 1,1,17
35 NEXT
40 FOR A=-PI TO PI STEP.01
50 CURSET A*30+120,SIN(A)*99+99,1
53 IF A>.5*PI AND A<0 THEN FILL 1,1,18:
   GOTO60
54 IF A<PI AND A>.5*PI THEN FILL1,1,17:
   GOTO60
55 FILL 1,1,RND(1)*5+19
60 NEXT
```

Colour Sin
by Alison Dowey

Space Eggs

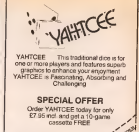
on BBC Micro

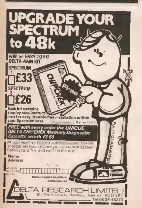
This type of program has been around for quite a long time The idea is to destroy the eggs before they land If they land many aliens come out of the eggs and destroy you The eggs fall from the sky first one at a time and then several at a time You control a fast moving gun base but you will still only get one shot at each alien.

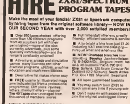
In entering the program the main problem will be getting the character definitions exactly right To make it easier to type in the program has been renumbered, so that the *Auto* command may be used

PROGRAM OF THE WEEK

```
10 REM ********************************
20 REM ***                          ***
30 REM ***     SPACE EGGS           ***
40 REM ***       32k BBC            ***
50 REM ***    BY Eddie Hold         ***
60 REM ***                          ***
70 REM ********************************
80MODE4
90NUM=0
100 DW=0
110ON ERROR RUN
120DIMAX%(10),AY%(10)
130PROCINIT
140CLS:MODE 7:PROCINSTRUCT
150 MODE4
160PROCTUNE
170PRINTTAB(12,0)'0000'
180PRINTTAB(5,0)"SCORE"
190VDU 23;8202;0;0;0;
200PROCBASE
210PROCWAIT(100-SC%*2)
220PROCALIEN
230PROCBULLET
240PROCBASE
250ON ERROR GOTO 10
260PROCBULLET
[illegible]PROCBASE
[illegible]GOTO[illegible]
[illegible]DEFPROCINIT
[illegible]BX%=19:SC%=0:YB%=0:XB%=-1
[illegible] FOR[illegible] TO 10
[illegible]AX[illegible]=-1+RND(36):AY%[illegible]=[illegible]
[illegible]NEXT
[illegible]
[illegible]
[illegible]VDU[illegible]16,[illegible]124,254,255,[illegible]5,255
[illegible]VDU[illegible]252,252
[illegible]VDU23,25[illegible]1,63,255,255,63,31 15
[illegible]VDU2[illegible]240,248,25[illegible],255,255,25[illegible]
  248,240
400VDU2[illegible]227,16,16,16,16,16,56,16,56
410VDU2[illegible]28,1,3,7,15,255,255,255,240
420VDU2[illegible]255,255,255,255,255,255,
  255,255
430VDU2[illegible]1,128,192,224,240,255,255,
  255,15
440VDU2[illegible]1,[illegible]40,255,255,255,157,[illegible],1
450VDU 2[illegible]255,255,255,255,175,235,
  255,[illegible]
460VDU2[illegible]15,255 255,255,240,224,192,
  128
470ENVELOPE[illegible]100,0,0,0,0,0,0,0,0
480ENVELOPE[illegible]0,0,0,0,9,0,-2,-2,
  120,80
490ENVELOPE[illegible]28,14,7,0,0,0, 80,
  80,80
500ENDPROC
510DEFPROCBASE
520B1%=BX%
530IF A$<>"K" THEN IF ADVAL1>44000 AND
  BX%>1 BX%=BX%-1
540IF A$="K" THEN IF INKEY(-26)AND BX%>1
  BX%=BX%-1
550IF A$<>"K" THEN IF ADVAL1<2200 AND
  BX%<37 BX%=BX%+1
560IF A$="K" THEN IF INKEY
  (-122)AND BX%<37 BX%=BX%+1
570PRINTTAB(B1%-1,31);SPC(3);
580PRINTTAB(BX%-1,31);:VDU224,225,226
590ENDPROC
600DEFPROCBULLET
610 IF A$<>"K" THEN GOTO650
620IF YB%=0 AND NOTINKEY(-1) ENDPROC
630IF YB%=0 XB%=BX%:SOUND0,1,7,5:SOUND1,
  2,20,9
640 GOTO670
650IF YB%=0 AND  NOT ADVAL0 AND 1 ENDPROC
660IF YB%=0 XB%=BX%:SOUND0,1,7,5:SOUND1,
  2,20,9
670PRINTTAB(XB%+1,30-YB%);:VDU127,11,227
680IF YB%=28  THEN YB%=0:VDU127,11:ENDPROC
690YB%=YB%+1
700ENDPROC
710DEFPROCALIEN
720SOUND2,-8,((SC%+1)DIV4)MOD255,1
730FOR N1%=1 TO SC%/10+1
740IF ABS(XB%-AX%(N1%)) <2 AND ABS(30-YB%
  -AY%(N1%)) <2 PROCSHOT
750IF AY%(N1%)<3 THEN 780
760PRINTTAB(AX%(N1%)-1,AY%(N1%)):CHR$250:
  CHR$251:PRINTTAB(AX%(N1%)-1,AY%(N1%)-
770IF AY%(N1%) 30 THEN PROCALMOVE:
  PROCDEAD
780AY%(N1%)=AY%(N1%)+1
790NEXT
800ENDPROC
810DEFPROCSHOT
820PRINTTAB(AX%(N1%)+2,AY%(N1%)-1);:VDU
  127,127,127,11,9,9,9,127,127,127
830SC%=SC%+1
840AY%(N1%)=-RND(50):AX%(N1%)=RND(36)+1
850PRINTTAB(XB%,30-YB%);SPC(1):YB%=0:
  XB%=-1
860SOUND3,3,50,10
870PRINTTAB(14,0);SC%;'0'
880ENDPROC
890DEFPROCWAIT(WT%)
900FOR WA%=1 TO WT%:NEXT
910ENDPROC
920DEFPROCDEAD
930SOUND0,-10,7,25
940FOR C1%=150 TO 1 STEP -5:SOUND1,-
  7,C1%,1:NEXT
950 PROCTUNEA
960PRINTTAB(9,15)"Another game?"
970*FX 15,1
980A1$=GET$
990IF A1$="N" CLS:END
1000CLS
1010GOTO 140
1020PROCTUNE
1030PRINTTAB(12,0);'0000'
1040BX%=19:YB%=0:XB%=-1:SC%=0:N1%=10
1050FOR C0%=1 TO 10
1060AX%(C0%)=1+RND(36):AY%(C0%)=3
1070NEXT
1080AY%(1)=-20
1090ENDPROC
1100DEFPROCINSTRUCT
1110PRINT'TAB(14,3)CHR$141;"SPACE EGGS"
1120PRINTTAB(14,4)CHR$141;"SPACE EGGS"
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```
1130PRINTTAB(14,5)CHR$141;',----------'
1140PRINTTAB(14.6)CHR$141;'----------'
1150PRINTTAB(1,8)'The Earth is";
1160PRINT" being invaded by eggs '
1170PRINT' that are being dropped from an
        alien"
1180PRINT' spacecraft that is out of
        sight."
1190PRINT" Only you can save the ";
1200PRINT" Earth by using "
1210PRINT' the following
1220PRINT'" A laser gun - press 'SHIFT'
        to use"
1230PRINT'' Use the cursor keys ';
1240PRINT' to move left/right"
1250PRINTCHR$136;CHR$146' WARNING :CHR$
        135;CHR$137' - If the eggs land",
1260PRINT  aliens "
1270PRINT' run out of them and kill you
        instantly.'
1280PRINT' So be warned''
1290PRINT" "Press 'CHR$133;CHR$136;"  K  ,
1300PRINTCHR$135;CHR$137" for keyboard or
    ;CHR$133;CHR$136;''J'";CHR$135;CHR$1
    37;'forjoystick to start'
1310*FX15,1
1320A$=GET$:IF A$="K' THEN CLS:ENDPROC
1330IF A$="J' THEN CLS:ENDPROC
1340 GOTO 1320
1350ENDPROC
1360DEFPROCTUNE
1370RESTORE 1460
1380FOR Q=1 TO 6
1390READA,B
1400READC,D
1410SOUND1, 15.A,B
1420SOUND2,-15,C,D
1430NEXT
1440FOR L=1 TO 3700:NEXT
1450ENDPROC
1460DATA129,10,33,10,149,5,53.5,145,5,49,
    5,127,10.33,10,149,10,53,10,129,20,3 ,
    20
1470DEFPROCTUNEA
1480FORW=1 TO 4000:NEXT
1490RESTORE 1570
1500FOR Q=1 TO 7
1510READE,F
1520READG,H
1530SOUND1,-15,E,F
1540SOUND2,-15,G,H
1550NEXT
1560ENDPROC
1570DATA149,5,53,5,129,5.33,5,137,5,41,5,
    145,5,49,5.149,5,53,5,157,5,61,5,149,2
    0,53,20
1580DEFPROCALMOVE
1590VDU23,254,60,126,219,255,126,60,36,66
1600FF=1
1610FOR CF=1 TO 30
1620PRINTTAB(AX%(N1%)-CF,29)CHR$254.
1630 NEXT
1640LET FF=FF+1
1650PRINTTAB(AX%(N1%)+FF,29)CHR$254;
1660IF (AX%(N1%)+FF)>38 THEN ENDPROC
1670GOTO 1640
1680ENDPROC
```

Space Eggs
by Eddie Hold

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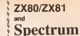
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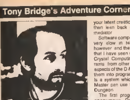
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Dungeon Master

This week a Spectrum review (yes another I m afraid but I have to reflect in this column the popular feeling which at the moment is toward Adventure programs for the good old Sinclair machine — outselling others by a factor of, I d guess, 10!)

Many of the letters we receive are from D & Ders This section of the Adventuring community are those souls who once used to sit around a large piece of graph paper with other like-minded people, indulging in Role Playing Games (RPGs for short) The best-known of these was, and is Dungeons and Dragons hence D & D

Created by the venerable Gary Gygas and Dave Arneson in the 1970s this game is played typically by several people who attempt to solve the mysteries of a complex of Dungeons (originally but as often as not, nowadays a network of streets in post-nuclear New York or a spaceship in the staggeringly distant future or ...) This complex is the brainchild of the Dungeon Master who maps out the playing-area before the players arrive, and populates the complex with Monsters Treasures Traps and so on He takes no part in the exploring of the caves except as a divine presence, giving the players guarded information as to what they can currently see, or how they are faring in battle A large amount of information rules and scenarios has been built up over the years until now a whole world of details may be experienced when playing RPGs

It seems a fairly obvious area of exploration as far as computer games are concerned — the computer after all would be the most unbiased referee and the least likely to forget anything in the heat of the battle Merely program all the details of your latest creation into the computer and then lean back and let it take over as mediator

Software companies seem to have been very slow in taking up the challenge however and the only real D & D program that I have seen is *Dungeon Master* from Crystal Computing Several other programs from other companies take certain aspects of the D & D rules and incorporate them into programs but *Dungeon Master* is a system which the budding Dungeon Master can use to create his or her own Dungeon

The first program on the tape is the eponymous *Dungeon Master* Once *Loaded* the program will ask the player if a previously created character is to be introduced to the system If not the *Dungeon Master* will create one for you The attributes, in true D & D fashion are constructed from parameters such as Strength, Intelligence Agility and Charisma (there are a couple of others) Then the player ventures into the Dungeon set up by the program In the Dungeon, the usual Adventure commands such as *Look Keep Drop* and so on are recognised and the Adventure continues as usual

The Dungeon on this side of the tape is merely an example however The second side of Crystal s tape contains a program called *Dungeon Creator*, which is as good as its word in allowing the user to create a Dungeon of their own

This program is really powerful and a great boon to anyone vaguely interested in D & D *Dungeon Creator* provides all the facilities you need to enter and modify or edit your customised Dungeon for use with *Dungeon Master* The menu contains *Create Inspect, Extend Modify Append Load Save* and *Quit*

These are all fairly obvious — *Create* assumes that the user has first of all planned the Dungeon on paper The program asks how many rooms or locations the user requires and then goes on to set up the exits and then contents of the rooms all at the user s instigation A list of Monsters in degree of nastiness is presented and the user may stipulate which Monster he wishes to appear in each room The same procedure is adopted with weapons and potions

Apart from the Monsters and Potions, Spells may also be put into each room and these range from the Astral Escape Spell through the Rod of Annihilation to the Curse Scroll each of which have a different degree of difficulty

Having thus created the Dungeon the user may then *Inspect* each room, and modify or edit as necessary Another option is to *Append* or add yet more rooms in a 3D matrix if required Finally the created Dungeon may be *Saved* to tape, and then *Loaded* into the *Dungeon Master* and explored

The system from Crystal Computing will prove to be a welcome friend to the D & D enthusiast who may well be making his first foray into the world of micros *Dungeon Master/Creator* is from the same stable as *The Halls of the Things* which I enthused about a few weeks ago, and although the people behind Crystal Computing are rather deprecatory of *Dungeon Master*, I very much enjoyed using the system It s probably a bit too complex to be anything other than an amusing way of filling a few spare moments, but the characters that can be created would be easily transportable to your own Dungeon

Next week I shall be looking at more of your problems ■

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MAGAZINES

DRAGON USER

To make the most of your Dragon you need **Dragon User** — the independent magazine for Dragon owners. To make sure that you receive a copy of Dragon User regularly subscribe direct to us. A year's subscription costs £8 for 12 issues or subscribe for two years for £14.40 and receive a free copy of either **The Working Dragon** or **Dragon Gamesmaster** (overseas rates available on application). Send a cheque or postal order made payable to Dragon User, and accompany by your name and address, to Dragon User Subscriptions Department, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH

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Dream Software PO Box 64
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PROGRAMMERS WANTED (Basic Machine) for most home micros to develop own and house progs. Write Computer Shop Software, PO Box 28, London SE3 7AU

WANTED Vic20 cartridges Submarine Commander and Outworld, also software to swap. Tel (0706) 44003 or 353718

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FULLER ZX81 KEYBOARD few months old, hardly used, offers £20 of magazines for £12. Tel 041-632 8325 (5 pm)

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ZX81 + 16K Ram, magazines, programs, pre-recorded games cassette including Flight Simulator. All boxed and in very good condition. Reason for sale — upgrading to bigger system — £45. Tel Southampton 454979

ZX81 16K + £10 worth magazines + Scramble software £45 ono. Tel 0332 670466

ZX81 1K, tape recorder, magazines, still boxed £30. Tel Cockermouth 824202

ZX81 16K, leads and manual £30, software, recorder, magazines, £70 ono. Tel Newton Abbot 60077 (6 pm)

ZX81 16K, sound pack £50, software, plenty of mags, all for £75. Tel Rochdale 352966

COMPUTER SWAP

COMPUTER SWAP

Computer Swap entries are limited to 30 words. Either fill in the accompanying form and send it to Computer Swap, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD or telephone 01-734 3454

All software offered through computer swap must be in original condition and for private sale only

Warning. It is illegal to advertise pirated software

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VIC20 + cassette + joystick £85 16K switchable Ram pack £25 All in good condition and boxes Tel Heathfield (East Sussex) 3857 (evenings and weekends)

VIC20 + C2N cassette deck + 16K Ram pack + super expander cartridge + two joysticks + three games cartridges (including Jelly Monsters) + £100-worth of other software + many books and magazines for Vic only £225 ono Tel 01 551 2708

Adventure competition

THE winner of our recent adventure competition is C Woodward with his program *The Falls of Shalor*. Although a text only adventure, it was sufficiently imaginative to just beat off the competition. C Woodward receives a Commodore 64.

A Vic20 was also awarded to Mrs K Hildick-Smith for her adventure scenario set on board a space ship orbiting an unknown planet

VIC20 + cassette unit + 16K Ram pack + £200 worth software including Gorf and Omega Race + two others + books great collection cost over £800 sell for £200 ono Tel Ashford (Middlesex) 55378

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Dragons for sale

DRAGON 32 two weeks old hardly used guarantee card Pac-man two cassette games joystick books £140 ono Tel 01 778 1033 (6 pm)

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DRAGON 32 manuals PSU one month joystick £80 of software books £100+ magazines including Dragon User 80 + listings large b/w television blank cassettes proven cassette recorder £225 ono Tel 0908 816840

UNUSED DRAGON 32, tape recorder joysticks, M/C book, 30 programs book, cassettes Donkey King Shuttle Planet Invasion Black Sanctum Defence + others worth over £280 will accept £240 Tel Lisle Wick Green 2518

Ataris for sale

ATARI 800 48K BASIC manuals joystick £285 Tel 01 580 7749

ATARI 400 computer for sale + basic 3 months old £110 Tel 307 1582

ATARI 400 48K BASIC cartridge £200 ono Tel 287 8636

ATARI 400 16K, in box with warranty £105 ono Tel Whitney (0993) 75478

ATARI 800 48K six months in box £210 ono Tel Whitney (0993) 75478

ATARI VCS with four cartridges plus paddles and joysticks will sell for £50 less than third of cost price Will delivery anywhere in London Phone Vince on 01 888 2931

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Spectrums for sale

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SPECTRUM 48K, mint condition hardly used + software only £100 Tel 061 3365537

SPECTRUM 48K, £90 Tel John on 01 941 4761 (Hampton)

SPECTRUM 48K, manuals ZX Printer seven paper rolls custom case tv to Spectrum changer Good software including Hobbit, Time Gate Hungry Horace good condition, £150 Tel 0206 240426

SPECTRUM 80K with boxes — Fuller keyboard + tape recorder + approx 60 games including Hobbit, Penetrator Time Gate + amplifier + five boxed and magazines £240 Tel Uxbridge 63521

Tandys for sale

TANDY TRS 80 16K extended basic colour computer + books leads cover etc cost over £300 sell for £225 Tel Sheffield 454739

TANDY TRS 80 LEVEL I, 16K with software light pen and manuals any reasonable offer Tel 01-692 8086

TRS 80 LEVEL 2, 16K green monitor + numerous tapes and books £160 ono Tel Leamington Spa 26506

TRS 80 MODEL 3, 48K two drive model with internal monitor with 30 discs and much software and magazines cost £1 700 in November 1982 sell for £975 ono Tel 01 572 2917 Ask for Bill (upcharing)

For sale

TO SELL OR SWAP Planet of Death Planetoids Set Pac Tranz Am Cookie Jumping Jack Ah Diddums Schizoids Football Manager Horace Goes Skiing 3D Tunnel and loads of magazines Write to 13 Ward Avenue Cleveleys Lancs FY5 1BL (private sale)

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SPECTRUM GAMES £3 EACH Time Gate (48K) Meteorstorm (16K) Spectral Invaders (16K) Orbitor (16K) Arcadia (16K) Scramble (16K) Tel 08076 60927 (after 4 pm) (private sale)

Wanted

WANTED Hardback carrying case for the Vic20 where the computer can be worked without removing from case Tel 061 7738426

SWAP five volumes of Knack magazine for Vic20 motherboard or any other add-on extra Tel 061 7738426

WANTED Single 100K disc drive for BBC must be in good condition Tel Hull 869517

WANTED BBC compatible printer and disc drive will pay £100 for each item Tel Harpenden 68152

CB plus Aerial plus Microphone plus SWR metre plus power pack swap for 16K Spectrum Tel Nottingham 875117

WANTED Zoom (cassette by Imagine Software) swap for KNOT In 30 Tor rordaktil 40 Tel Adam Chesham 785285

WANTED BBC Model A, will pay £200 Tel 0278 732356

HALF THE SIZE

Apart from finding different subjects for books publishing houses seem also to be producing different sizes of book to distinguish theirs from all the others and keep prices down

As part of its Q+A series Newnes technical books has issued *Basic Programming* by Peter Lafferty

Without criticising the actual contant the book has two things to distinguish it the fact that it is about half the usual size of a book, and its format

The latter is interesting — a general introduction to Basic is given in the form of Questions and Answers Eg What is a loop? What are User defined characters? This should make it easier for people to get a specific point answered without searching through a mass of text

Book *Basic Programming*
Price *£2 50*
Micro *General*
Publisher *Newnes Technical Books*
Borough Green
Sevenoaks
Kent TN15 8PH

MACHINE CODE

If you look at *Popular Computing Weekly*'s book charts (and I'm sure you do) you will have noticed that it's actually the more technical computer books that are selling well — everyone, it seems wants to learn machine code

The problem is of course that machine code is not easy and, particularly to begin with, most people find the going pretty tough

With *Z80 Machine Code for Humans* Granada is trying to simplify the task without being machine specific The book is designed for the novice — it gradually builds up machine code skills by using short routines

Book *Z80 Machine Code for Humans*
Price *£7 95*
Micro *General (Z80 processor)*
Publisher *Granada Publishing*
PO Box 9
Frogmore
St Albans
Herts AL2 2NF

INSOMNIAC

Ian Sinclair's output is astonishing, every week we seem to get another book — does the man ever sleep?

The latest addition is *Inside Your Computer* which is designed to introduce novices to the bits and pieces 'under the bonnet' of their machine

Chapters discuss The Basic Interpreter, Inputs and Outputs and the Microprocessor

One useful section illustrates the correct way to add additional chips to your computer (a 48K upgrade on your Spectrum for example) which can be surprisingly difficult and infuriating if you get it wrong

Book *Inside Your Computer*
Price *£4 95*
Micro *General*
Publisher *Granada Publishing*
PO Box 9
Frogmore
St Albans
Herts AL2 2NF

NOVICE

The Epson HX 20 tends to be forgotten amongst all the Spectrums, Dragons and BBCs of this world but it has sold well

Getting Started with the Epson HX20 is actually one of only a few books on the machine

As the title suggests it is intended for the absolute novice The various terms of Basic are introduced and illustrated — in view of the fact that the Epson was first sold as a portable business machine it is perhaps not surprising that the examples and programs are geared towards serious uses rather than games

Book *Getting Started with the Epson HX20*
Price *£5 95*
Micro *Epson HX20*
Publisher *Phoenix Publishing*
14 Vernon Road
Bushey
Herts WD2 2JL

ADVENTURES

The first of what's likely to be a veritable surge of books on Adventure games has been issued by well, by us actually

Tony Bridge, grand inquisitor and elf most high of our adventure department, has written a book called *Spectrum Adventures*

The first section of the book examines the history of adventures and discusses the themes common to all of them. Subsequent sections take you through the development of your own graphic adventure, constructing mazes, creating monsters, and so on

I should add that the 48K program contained within the book was programmed by Roy Carnell

Book *Spectrum Adventures*
Price *£5 95*
Micro *Spectrum (Adventure needs 48k)*
Publisher *Sunshine Books*
12 13 Little Newport Street
London WC2R 3LD

EXPENSIVE

Whatever else American produced computer books are they are expensive — £15 95 for 214 pages and only black and white diagrams is quite a price

Pascal programs for games and graphics consists of 22 programs designed for the Apple with UCSD Pascal

The author Tom Swan has written a number of books specialising in Pascal and in this book his intention is to teach the language through the games — perhaps if you have a 64K Apple and twin disk drives (which is more or less the minimum requirement) you may not find nearly £16 for a book so hard to bear

Book *Pascal Programs for Games and Graphics*
Price *£15 95*
Micro *Apple 64K + Disc + Pascal*
Publisher *John Wiley & Sons*
Shipney
Bognor Regis
West Sussex PO22 9SA

INTRODUCTION

The Personal Computer Handbook is designed both to be a general introduction to the subject of what a computer is and also a practical buyers' guide to what's on the market and how they compare

If that weren't a large enough subject it ends with some programs and various lists of computer clubs and other books

Obviously it's not possible to go into very much depth — the machine reviews are two pages each — and there are some surprising omissions and more inevitably errors of fact

Perhaps the disparate elements look a bit cobbled together but it's cheap and potential buyers may find it useful

Book *The Personal Computer Handbook*
Price *£3 95*
Micro *General*
Publisher *Virgin Books*
61/62 Portobello Road
London W11 3DD

MONSTERS



Believe it or not there was no version of *Puckman* for the One — until now

Oricmunch appears to offer all the features of the original arcade game including the prizes for good scores like cherries and lemonade

Although usually you have a fighting chance against the monsters should you eat two of them they double in speed The game is the first of an intended series of arcade games to be released by Tansoft over the next few months

Program *Oricmunch*
Price *£7 95*
Micro *One 16/48K*
Supplier *Tansoft*
3 Club Mews
Ely
Cambs CB7 4NW

SADISTIC

Brilliant software is a company specialising in adventure games *Was Out West* is for the Dragon 32

Your task is to make your fortune in a gold mine, armed only with your trusty 32 and an enigmatic clue "Having a sadistic nature helps"

The game is said to be highly complex and so a *Save* instruction is included

Program *Way Out West*
Price *£6 95*
Micro *Dragon 32*
Supplier *Brilliant Software*
10 Newlands Drive
Gedling
Nottingham NG4 3HU

KEYWORDS

A whole range of additional Keywords to Spectrum Basic are made available by *Beta Basic* from Betasoft

The program includes 26 new Keywords and 10 new Functions The Keywords include *Alter* for extensive manipulation of the attributes file *Dpoke* for a double *Poke*, *Rnum* to renumber the program etc

The Functions allow for decimal/hex conversion and number formatting

All Keywords are simple entry, with full syntax check on entry The program which also provides for a Trace facility comes complete with an extensive manual

Program *Beta Basic*
Price *£11 00*
Micro *Spectrum 48K*
Supplier *Betasoft*
92 Oxford Road
Moseley
Birmingham B13 9SQ



VICIOUS

The first part of a "multiplayer fantasy adventure game" is called *Usurper* and is for the 48K Spectrum

The game is for up to 10 players who compete (viciously) against one another until one becomes strong enough to tackle the King

As each player spins out their Machiavellian plots, instructing the computer where to move who to kill fate may intercede in the dread form of Vampires ghouls and other beasts

Program *Usurper*
Price *£6 00*
Micro *Spectrum 48K*
Supplier *Assassin Software*
10 Ash Road
Leeds LS6 3UF

LILY LIVERED

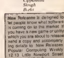
If the gory cover and the warning "Parental guidance recommended for children under 16 years" are anything to go by *Hells Temple* (excuse the pun) is one hell of a program

The game claims to have over 70 monsters the setting is *Hells Temple* where "only courage sorcery and a strong sword arm rules" (can you imagine an adventure game where lily liveredness running away and quaking with fear hold sway?)

Within *Hells Temple* are various riches as well as the aforesaid monsters — at each stage your computer gives you a 3D view of the Temples catacombs The producers of the game have incorporated a nice idea — they have set up a club for *Hells Temple* enthusiasts to correspond together, swap notes etc

Program *Hells Temple*
Price *£12*
Micro *Oric 1 48K*
Supplier *Kecome Associates*
1 Marlborough Drive
Worle
Avon SB22 0DO

GNASHERS



Richard Shepard Software has produced games which have consistently been in the top ten Spectrum charts

The latest program is described as a "3D graphic adventure" and is entitled *Devils of the Deep* You must explore the lost city of Atlantis, locate its treasure and bring it back to your boat

The games boasts 100 screens, each depicting a different section of sea bed The monsters of the title are giant electric eels whose one weak spot is their gnashing jaws

Around the ocean bed are various objects including a harpoon gun, harpoons, spade and a knife Sophisticated game players may have to face giant crabs

Program *Devils of the Deep*
Price *£6 50*
Micro *Spectrum 48K*
Supplier *Richard Shepard*
Elm House
23-25 Elmshott Lane
Cippenham
Slough
Berks

New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12 13 Little Newport Street London WC2R 3LD

Ziggurat



Study studies

My comments a few issues ago about the child and A levels prompted one particularly interesting response

The reader about to choose his A levels commented 'Your saying that Computer Science A level has no real use has only made me more confused about a confusing subject — the types of jobs in computing and the qualifications required for each

My correspondent asked if I would discuss what jobs opportunities and qualifications exist in computing as he would like to work with computers He is starting A levels this September

Incidentally the academic renegade saw my piece recognised himself and still disagreed

Many of the jobs I might have wanted as a youth no longer exist When I was decding" (or having decided for me) my O level subjects there were no more than 200 computers in Britain and I had not heard of any of them

Within two years in personal computing we have seen the rise of the software house whose output is basically games We have recently seen the promise (if promise be the correct word) of cable software and software over the telephone The opportunities are changing all the time

My O levels fitted me perfectly for the computer age even though the computer age was not to come for several years The reason they fitted so well was the range of subjects I had to take

We all had to take Mathematics one foreign language English Language and English Literature Those four subjects should be the basis of any selection of O level subjects I then look two science subjects and two arts subjects

These O levels enabled me to pick and choose from any subject at A level not based on some silly idea that I was either a science or an arts person because of my O levels. It also meant that I was not already funnelled into some career at an incredibly early age

Given the syllabus of most of the Computer Science O level courses I have examined the value of the subject as a preparation for A levels in general seems almost nil The academic content of Computer Science O levels appears far too low

What is usefully learnt with O level Computer Science that cannot be learnt from playing with computers and reading magazines?

A very similar attitude should influence your choice of A levels At A level you have a chance to study fewer subjects in greater detail How you study and what you study are influenced by how you see education

If you see education merely as a means to an end, the end being a job, then I think that is being short sighted The Government s training initiatives are of this nature youngsters — who do not know better — foregoing education to be trained in vocations which might not last beyond a few years

Education should be about helping people to learn to be adaptable to learn to think and learning a basis of knowledge which will help whatever the future might bring

Essentially choose the subjects at 'A level which interest you as long as the subject has a strong academic (usually non vocational) content If you are interested in languages take languages at A level If you are interested in the humanities take humanities A levels or if as I was you are interested in maths and the sciences take those A levels

Computer Science A level is basically a non academic vocational subject and is not a preparation for computing Indeed it is not accepted on many computer science degrees

There again computer science degrees are no easy way into computing either

If you are interested in computing then compute Write programs and try to sell them try to extend your knowledge by reading widely and try to see if you can use a computer to do new things other than zap

In computing, and related areas you are judged by what you know and what you can do — not by your qualifications ■

Boris Allen

Puzzle

Eight divided by four

Puzzle No 74

What s eight divided by four?

This unexpected question from my daughter came as a bit of a surprise Two of course! I replied and then instantly realised this was no ordinary question No! she exclaimed eight divided by four is three

And so it was as she was able to demonstrate By writing down the division sum in words it was possible by substituting digits for the letters to make the sum correct

$$\frac{\text{EIGHT}}{\text{FOUR}} = 3$$

Each of the letters represents a different digit but no zero is used Also eight and four are (of course) both even numbers

Solution to Puzzle No 69

There is one slight catch in the problem By convention 0! is equal to 1 not zero as might be supposed

Consequently line 210 of the program treats any zero as though it were a 1 (thus having a factorial value of 1)

One program which gives the right answer is

```
10 LET N = 1 20 LET N$ = STR$ N 30 LET T = 0 40 FOR A = 1 TO LEN N$ 50 LET M = VAL (N$(A)) 60 GOSUB 200 70 IF T>N THEN GOTO 100 80 NEXT A 90 IF T = N THEN PRINT N 100 LET N = N + 1 110 GOTO 20 200 LET Q = 1 210 IF M = 0 THEN LET M = 1 220 FOR P = 1 TO M 230 LET Q = Q * P 240 NEXT P 250 LET T = T + Q 260 RETURN
```

This program produces the only other number apart from 1 2, and 145 which is the sum of the factorials of its digits This number is 40 585

Winner of Puzzle No 69

The winner is Francisco Santos Rua Bartolomeu Dias 2900 Setubal Portugal who receives £10

Top 10

Atari

1	(2)	Miner 2049er	(Big Five)
2	(1)	Diamonds	(English)
3	(4)	The Curse of Crowley Manor	(Adventure International)
4	(—)	Panel in Danger	(Avalon Hill)
5	(—)	Golden Baton	(Channel 8)
6	(—)	Astro Chase	(First Star)†‡
7	(10)	Zaxxon	(Datasoft)
8	(—)	Jumpman Junior	(Epyx)
9	(—)	Mountain King	(CBS)
10	(9)	The Slime of Blackpoole	(Sirius)

Cartridge †32K cassette ‡48K disc §32K disc

[Figures compiled by Calisto Computers Birmingham 021-632 6458]

BBC*

1	(—)	Hunchback	(Superior)
2	(5)	Danger UXB	(Program Power)
3	(1)	Felix in the Factory	(Program Power)
4	(6)	Starship Command	(Acornsoft)
5	(7)	Centipede	(Superior)
6	(—)	Snooker	(Acornsoft)
7	(—)	Frogger	(A + F)
8	(5)	Great Britain Limited	(Simon W Hessel)
9	(10)	Alien Swirl	(Program Power)
10	(—)	Chess	(Computer Concepts)

* All model B

[Figures compiled by Micro Management, Ipswich 0473 59181]

ZX81

1	(1)	Chess	(Psion)
2	(2)	Space Raiders	(Psion)
3	(4)	Flight Simulation	(Psion)
4	(5)	Football Manager	(Addictive Games)
5	(6)	Fantasy Games	(Psion)
6	(—)	CB Scramble	(Quicksilva)
7	(8)	Asteroids	(Quicksilva)
8	(3)	Espionage Island	(Artic)
9	(—)	Defender	(Quicksilva)
10	(—)	Ship of Doom	(Artic)

All run in 16K

(Figures compiled by Boots & Co London)

Dragon

1	(1)	The King	(Microdeal)
2	(2)	Frogger	(Microdeal)
3	(3)	Talking Android Attack	(Microdeal)
4	(8)	Space War	(Microdeal)
5	(4)	Night Flight	(Salamander)
6	(6)	Ring of Darkness	(Wintersoft)
7	(10)	Planet Invasion	(Microdeal)
8	(—)	Quest	(Dragon Data)
9	(7)	Monaco Grand Prix	(Microdeal)
10	(—)	Dragon Trek	(Wintersoft)

(Figures compiled by Boots & Co. London)

Spectrum

1	(—)	Tranz Am	(Ultimate)
2	(8)	The Hobbit	(Melbourne House)
3	(1)	Jet Pac	(Ultimate)
4	(2)	Scrabble	(Psion)
5	(3)	Flight Simulation	(Psion)
6	(5)	Horace Goes Skiing	(Psion Melbourne House)
7	(—)	3D Tanx	(DK Tronics)
8	(4)	Horace and the Spiders	(Psion Melbourne House)
9	(6)	Ah Diddums	(Imagine)
10	(—)	Test Match	(Computer Rentals)

Requires 48K

(Figures compiled by W H Smith and Sons London)

Books

1	(4)	Structured Programming with BBC Basic, Atherton	(Harwood)
2	(—)	Commodore 64 Programmer s Reference Guide Commodore	(Commodore)
3	(4)	Assembly Language Programming for BBC Micro Birnbaum	(Macmillan)
4	(1)	Complete Spectrum Rom Disassembly Logan and O'Hara	(Melbourne House)
5	(—)	Programming the 6502 Zaks	(Sybex)
6	(—)	Basic Programming on the BBC Micro Cryer	(Prentice Hall)
7	(2)	Commodore 64 Machine-code Master Lawrence and England	(Sunshine)
8	(10)	Anatomy of the Dragon James	(Sigma)
9	(5)	Complete Forth Winfield	(Sigma)
10	(9)	Spectrum Hardware Manual Dickens	(Melbourne House)

(Figures compiled by Watford Technical Books Watford 0923 23324)

[Last week s position in brackets]

Vic20

1	(1)	Arcadia	(Imagine)
2	(3)	Wacky Waiters	(Imagine)
3	(2)	Sky Hawk	(Quicksilva)
4	([illegible])	Cosmiads	(Bug Byte)
5	([illegible])	Catcha Snatcha	(Imagine)
6	(4)	Cosmic Crunch	(Commodore)
7	(5)	Grid Runner	(Llamasoft)
8	(7)	Sargon II Chess	(Commodore)
9	([illegible])	Frantic	(Imagine)
10	(6)	Panic	(Bug-Byte)

Cartridge

[Figures compiled by Boots & Co London]